NEED FOR COAST GUARD ICEBREAKERS

OF MICHIGAN
OCT 7 1959
MAIN READING ROOM

HEARINGS

BEFORE THE

SUBCOMMITTEE ON MERCHANT MARINE

OF THE

COMMITTEE ON MERCHANT MARINE AND FISHERIES HOUSE OF REPRESENTATIVES

EIGHTY-SIXTH CONGRESS

FIRST SESSION

ON

H.R. 4

A BILL TO AUTHORIZE THE CONSTRUCTION OF A NUCLEAR-POWERED ICEBREAKING VESSEL FOR OPERATION BY THE U.S. COAST GUARD, AND FOR OTHER PURPOSES

and H.R. 288

A BILL TO AUTHORIZE THE CONSTRUCTION OF A NUCLEAR-POWERED ICEBREAKING VESSEL FOR OPERATION BY THE U.S. COAST GUARD, AND FOR OTHER PURPOSES

AUGUST 13 AND 14, 1959

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NEED FOR COAST GUARD ICEBREAKERS

THURSDAY, AUGUST 13, 1959

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MERCHANT MARINE
OF THE COMMITTEE ON MERCHANT
MARINE AND FISHERIES,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to notice, in room 219, Old House Office Building, Hon. Herbert C. Bonner (chairman) presiding.

Present: Representatives Bonner, Miller, Zelenko, Downing, Casey, Tollefson, Van Pelt, Mailliard.

Present also: Representatives Rivers and Johnson.

Staff members present: John M. Drewry, chief counsel, and William B. Winfield, chief clerk.

The CHAIRMAN. The committee will come to order.

The hearings that we are commencing this morning are on H.R. 4, a bill to authorize the construction of a nuclear-powered icebreaking vessel for operation by the U.S. Coast Guard, and for other purposes, and an identical bill, H.R. 288, by our ranking minority member, Mr. Tollefson.

(The bills referred to follow:)

[H.R. 4, 86th Cong., 1st sess.]

A BILL To authorize the construction of a nuclear-powered icebreaking vessel for operation by the United States Coast Guard, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there is hereby authorized to be appropriated to the Treasury Department, United States Coast Guard, and the Atomic Energy Commission, such sums as may be necessary, to remain available until expended, for the construction, outfitting, and preparation for operation, including training of qualified personnel, of a nuclear-powered icebreaking vessel capable of operation in icebound waters of the United States, and in the Arctic and Antarctic regions as may be required. The Treasury Department, and the Atomic Energy Commission, in carrying on activities and functions under this paragraph, may collaborate with and employ persons, firms, and corporations on a contract or fee basis for the performance of special services deemed necessary by such agencies in carrying on such activities and functions. The Treasury Department may, for the same purposes, with the approval of the Secretary of the Treasury and the agency or agencies from which assistance would be sought, avail itself of the use of licenses, information, services, facilities, offices, and employees of any executive department, independent establishment, or other agency of the Government, including any field service thereof.

[H.R. 288, 86th Cong., 1st sess.]

A BILL To authorize the construction of a nuclear-powered icebreaking vessel for operation by the United States Coast Guard, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there is hereby authorized to be appropriated to the Treasury Department, United States Coast Guard, and the Atomic Energy Commission, such sums as may be necessary, to remain available until expended, for the construction, outfitting, and preparation for operation, including training of qualified personnel, of a nuclear-powered icebreaking vessel capable of operation in icebound waters of the United States, and in the Arctic and Antarctic regions as may be required. The Treasury Department, and the Atomic Energy Commission, in carrying on activities and functions under this paragraph, may collaborate with and employ persons, firms, and corporations on a contract or fee basis for the performance of special services deemed necessary by such agencies in carrying on such activities and functions. The Treasury Department may, for the same purposes, with the approval of the Secretary of the Treasury and the agency or agencies from which assistance would be sought, avail itself of the use of licenses, information, services, facilities, offices, and employees of any executive department, independent establishment, or other agency of the Government, including any field service thereof.

The CHAIRMAN. These bills are identical to H.R. 9196, which was the subject of extensive hearings and very thorough study by the committee in the 2d session of the 85th Congress. That bill passed both Houses of the Congress with overwhelming support, but it was vetoed by the President on fiscal grounds.

Notwithstanding the veto of the authorizing proposal in the last Congress, the Chair reintroduced the measure at the beginning of this Congress because of a very strong conviction that the hearings last year conclusively established the desirability of such legislation, which would lay the groundwork for a project of long-range importance. In the light of that previous record and the rapid progress of events, I feel that it is my responsibility to review the proposal again at this time.

I would like to state at this point that the written reports from the departments on this bill—received early last spring—all reflect the position taken in the veto message on the predecessor bill. Nevertheless, it is gratifying to note that in no case do these reports give any other reason for failure to support the bill.

The Deparment of the Navy emphasized the need for more icebreakers and the need for replacement of the existing small fleet of overworked vessels of this type.

The Atomic Energy Commission commented on the advantages of the use of nuclear power in an icebreaker and the contribution that such a project might make to the material advancement of reactor technology.

The design, development, and construction of a nuclear icebreaker, under even the most favorable circumstances, is a relatively long-term project—possibly as much as 4 to 5 years from the time a clear signal to go ahead is given.

The Chair recognizes as much as anyone that under fiscal stress we may not be able to proceed with all necessary projects at a given time. In the interest of saving time, therefore, it is important to be able to proceed immediately with the needed project as soon as the fiscal picture eases enough. Therefore, I repeat that I feel that it is my responsibility to bring this matter up again to review the question of need for this type of facility, and if such need is found, to urge

enactment of appropriate authorizing legislation so the Coast Guard may at the proper time proceed with a minimum of delay to augment its capabilities in support of our commitments in polar and other icebound waters.

Factors which I believe indicate an increased need for vessels of this type are (*a*) the obsolescence of our existing icebreaker fleet, (*b*) our growing commitments in the polar regions, and (*c*) the opening of the St. Lawrence Seaway, with attendant interest in lengthening the navigation season.

Our list of witnesses includes the Department of the Navy appearing on behalf of the Department of Defense; Mr. William Francis Gibbs, the eminent naval architect who contributed extensively to the design and development of our existing icebreaker; Dr. Thomas F. Jones of the National Science Foundation, who is director of our antarctic programs; Vice Adm. A. C. Richmond, the Commandant of the Coast Guard; Hon. John McCone, Chairman of the Atomic Energy Commission; and Mr. Robert Faylor, executive secretary of the Arctic Institute of North America.

Today, I am calling first on the Navy witnesses as representatives of the principal Government consumer of icebreaker services; then Mr. William Francis Gibbs for a discussion of icebreaker design providing the maximum capability; and Mr. Thomas F. Jones of the National Science Foundation to give us a statement concerning our antarctic programs.

Incidentally, I might say that of all the hearings that I have sat through as chairman of this committee and as a member of the committee, I have never listened to a more interesting set of witnesses, nor have I read a more interesting report on the hearings than those that we conducted last year on this subject. I have recommended from time to time to those interested in the advancement of science and our future advancement of the United States as the great leader of the world, the reading of the hearings on this subject that are available.

The first witness this morning is Admiral Gano.

STATEMENT OF ROY A. GANO, VICE ADMIRAL, U.S. NAVY, COMMANDER MILITARY SEA TRANSPORTATION SERVICE

The CHAIRMAN. Admiral, I welcome you in your new status here today.

Admiral GANO. Thank you, Mr. Chairman. I am happy to be here. Mr. Chairman, I have a short statement. With your permission I will be happy to read it, sir.

The CHAIRMAN. You may proceed, sir.

Admiral GANO. Mr. Chairman and gentlemen, my name is Roy A. Gano, vice admiral, U.S. Navy, commander, Military Sea Transportation Service. I am appearing in response to an invitation to testify with respect to H.R. 4, which would authorize the construction of a nuclear-powered icebreaker for operation by the U.S. Coast Guard.

When appearing before your committee on January 22, 1958, at hearings related to similar bills introduced in the 2d session, 85th Congress, my predecessor, Vice Adm. John M. Will, U.S. Navy, who has since retired, outlined the arctic operations conducted by the Military Sea

Transportation Service since 1950, in connection with the constuction and support of the distant early warning (DEW line) sites. He presented a series of charts depicting the year-by-year development of these operations, followed by the showing of color slides, illustrating actual arctic ice conditions. Since Admiral Will's testimony is incorporated in the report of the previous hearings, I shall not impose upon the time of your committee in repeating these details.

Our arctic operations during the summer of 1958 embraced the sites located in the eastern regions, including Newfoundland, Labrador, Foxe Basin, the eastern coast of Baffin Island and the eastern and western coasts of Greenland. Our current 1959 operations cover the same areas except for Foxe Basin and the eastern coast of Baffin Island which, as predicted by Admiral Will, have become a Canadian commercial sealift responsibility.

I have supplied each member of the committee, Mr. Chairman, with a chart which outlines the area that we are now operating in in 1959.

Despite the fact that ice conditions this year have been generally much more favorable than in seasons past, our operations this summer have required the services of five icebreakers—the *Burton Island*, the *Edisto* and *Atka* of the U.S. Navy and the *Eastwind* and *Westwind* of the U.S. Coast Guard.

On the basis of the best information available, it appears that the requirement for the annual resupply of our arctic sites will prevail for an indefinite period and that there will be a continuing need for extensive icebreaker assistance. This would be true whether the sea lifts are performed by the Military Sea Transportation Service or should at some time be undertaken by private operators. In addition, there is the potential development of the iron ore and other mineral deposits in Labrador and Baffin Island, which Admiral Will mentioned in his testimony, that will bring additional commercial shipping into these waters.

With the opening of the St. Lawrence Seaway, the Great Lakes represent another area in which there will probably be an increased requirement for the services of icebreakers. So far this season, MSTS has arranged for the shipment of approximately 40,000 measurement tons of military cargo from Great Lakes ports to various destinations abroad and before the season closes, it is expected this total will exceed 80,000 measurement tons. There has been considerable discussion in the press relative to ways and means of extending the open season on the Lakes and until some more revolutionary method is devised, the use of icebreakers seems to be the only practical solution.

In addition to the areas I have mentioned, there are, of course, continuing needs for icebreaker services in the antarctic regions and in the Alaska area.

I am not an icebreaker expert, nor do I feel that I can voice an opinion on the relative merits of nuclear-powered propulsion. I defer to the judgments of those better qualified in this regard. My appearance before you today is simply for the purpose of acquainting your committee with the extent to which the services of icebreakers are now required and are likely to be required in the future. As of the present, the largest and most modern of the icebreakers we have are the *Mackinaw* of the Coast Guard and the *Glacier* of the Navy. The

balance are rapidly approaching obsolescence and it is my considered view that early action should be initiated to provide for some new construction.

Mr. Chairman, I shall be pleased to attempt to answer such questions as you and your committee members desire to ask that are within the scope of my knowledge.

The CHAIRMAN. When were the *Mackinaw* and the *Glacier* put into commission?

Admiral GANO. I think the *Glacier* has been within the last 5 years, about 1952 or 1953.

The CHAIRMAN. Does that apply to both of them?

Admiral GANO. I cannot speak for the *Mackinaw* but I know it is approximately a contemporary of the *Glacier*.

The CHAIRMAN. When was the *Mackinaw* put into commission?

Admiral RICHMOND. It was started during the war, sir.

The CHAIRMAN. You might say it is a war-built vessel. It was commissioned what year?

Admiral RICHMOND. I would like to correct this in the record but I think it was 1946. It might have been 1947.

The CHAIRMAN. That would make it at the present date how old?

Admiral RICHMOND. At least 12 years old, maybe a little more.

The CHAIRMAN. Do these ships advance in age more rapidly than the 20-year period we normally assign to a commercial vessel?

Admiral GANO. Well, Mr. Bonner, I know that they get very hard usage and I would judge that they do. How much I am not in position to say but it would seem to me that at the maximum about 20 years should be the normal life for an icebreaker ship.

The CHAIRMAN. Then we have one icebreaker of 6 years of age and one icebreaker of 12 years age.

Now, with respect to the other icebreakers we now have, what are the ages of those vessels?

Admiral GANO. I believe that they are now 15 years old.

The CHAIRMAN. What vessels are they?

Admiral GANO. They are all the *Wind* class.

The CHAIRMAN. They are all Coast Guard ships?

Admiral GANO. There are some of the Navy, too.

The CHAIRMAN. How many are Navy and what are their ages?

Admiral GANO. They were all built approximately the same time.

The CHAIRMAN. They were war-built vessels?

Admiral GANO. Yes, sir, and there are a total of nine, I believe, *Wind* class vessels.

The CHAIRMAN. Nine naval icebreakers?

Admiral GANO. No, sir. That includes both the Coast Guard and Navy.

The CHAIRMAN. Give me the Navy icebreakers. How many are there?

Admiral GANO. I will have to furnish that, Mr. Chairman.

The CHAIRMAN. I think that this record should be clear on what is available as icebreakers as of the present time, their age and condition.

Admiral GANO. I can furnish that, sir.

The CHAIRMAN. Can you give us the condition?

Admiral GANO. Yes, sir.

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(The information referred to follows:)

The following information is respectfully submitted:

1. Name, age, and general condition of all Navy icebreakers:

Name	Hull No.	Built	Age	General condition
Atka	AGB 3	July 15, 1944	15 years	Satisfactory.
Staten Island	AGB 5	Feb. 15, 1944	14 years	Do.
Burton Island	AGB 1	Dec. 18, 1946	13 years	Do.
Edisto	AGB 2	Mar. 20, 1947	12 years	Do.
Glacier	AGB 4	May 27, 1955	4 years	Do.

2. The average percentage of an icebreaker's time lost because of repair requirements: Approximately 30 percent of their time, made up of—

(*a*) Scheduled and restricted overhaul periods, and

(*b*) Periods of repairs after each ice operation to repair sustained damages.

3. The number of icebreakers required: Five. It is estimated that of the present five, two should be replaced within the next 5 years, and two within the next 10 years.

4. The length of time an icebreaker can operate without refueling: In the Arctic and Antarctic, under normal conditions the present Navy icebreakers can operate about three months without refueling.

The CHAIRMAN. Would you say that the present naval icebreakers are capable of extreme utilization at the present time?

Admiral GANO. Yes, sir. They have satisfied our needs in the Arctic for MSTS. We have had damage with them and will continue to have damage with them caused by ice, of course.

The CHAIRMAN. What is the percentage of the annual repair bill on such a vessel, from experience?

Admiral GANO. It depends on the season, but I would say that we can count on one or two icebreakers receiving damage during the season that they are in the Arctic.

The CHAIRMAN. Would that mean breaking down, as we might use the term, and therefore not being available during balance of that season?

Admiral GANO. That is correct. Well, they may come back toward the end of the season after we bring them down for repair, but I would say that on the average we need one or two more than actual needs in order to satisfy our overall requirements.

The CHAIRMAN. And in your opinion there is no doubt but that additional icebreakers are vitally needed, might we say?

Admiral GANO. Yes, sir; I can testify to that.

The CHAIRMAN. In what number?

Admiral GANO. You mean over what we have now? I would say that we need more modern ones and sturdy ones and ones of long endurance, and we need them now and need more than we have.

The CHAIRMAN. In what number?

Admiral GANO. I would think that we should start now and build one or two in order to take care of those that are now rapidly approaching obsolescence. It would probably be better to make it a progressive building program rather than one on which we went all out for 1 or 2 years.

The CHAIRMAN. Is a peacetime constructed vessel a better vessel than a wartime constructed vessel, from your experience?

Admiral GANO. Yes, sir; there is no question about that.

The CHAIRMAN. Therefore in peacetime we could build better icebreakers than we built during the emergency of World War II?

Admiral GANO. Yes, sir. That is correct, absolutely.

The CHAIRMAN. Mr. Tollefson.

Mr. TOLLEFSON. Do you know whether there are any icebreakers presently down in the Antarctic?

Admiral GANO. No, sir; I do not believe there are any there at all. All those icebreakers that are available to us at the present time are either getting ready for the Antarctic or are now emloyed in the Arctic.

Mr. TOLLEFSON. Are you familiar with the comparative ice conditions as between the Arctic and Antarctic? Is there any difference in the thickness of ice, and that sort of thing?

Admiral GANO. No, sir; I am not conversant with the difference in the ice. I understand that the Arctic ice is somewhat different due to the large number of icebergs and glaciers that they have to contend with. On the other hand, in the Antarctic they have the pack ice which bothers the icebreakers.

Mr. TOLLEFSON. If there was a need for one or two icebreakers in the Antarctic within the next year or two, obviously those one or two icebreakers would have to come from those which are now in existence. Would that cause a shortage in the number of icebreakers that you need where they are presently operated?

Admiral GANO. I would say "No," sir. We use the icebreakers from the Antarctic into the Arctic and vice versa. In other words, the seasons are entirely different, so you will find, except where there is damage or other need for repairs, that the icebreakers that serve in the Arctic also serve in the Antarctic to a certain extent.

Mr. TOLLEFSON. What if one were taken out of your present number and assigned the year round to the Antarctic?

Admiral GANO. Well, this would affect our operations. We need enough in most cases to force the season due to the present operations in the Arctic and that is primarily why we have our icebreakers up there in order to get in early and stay late.

Mr. TOLLEFSON. What I am trying to bring out, Admiral, is that, if this is a fact, you have only enough icebreakers to meet current needs, and, if the needs increase, there will not be enough icebreakers?

Admiral GANO. That is correct, sir.

Mr. TOLLEFSON. You make mention of the St. Lawrence Seaway, for instance.

Admiral GANO. Yes, sir.

Mr. TOLLEFSON. If there were a greater demand for utilization of icebreakers there, then you would not have enough to do other things?

Admiral GANO. That is correct, sir, and I look forward to the day when we will have to keep the St. Lawrence Seaway open because this will be an extension of our seacoasts.

Mr. TOLLEFSON. How long is the season open there now?

Admiral GANO. Nine months, approximately.

Mr. TOLLEFSON. So that, if there was an attempt to keep the seaway operation open year round, you would have to have one or two icebreakers assigned there constantly?

Admiral GANO. That I do not know. I think I would have to confer with the Coast Guard on that.

Mr. TOLLEFSON. What about the refueling of the present type of icebreaker? Does that present a problem?

Admiral GANO. No, sir. It has not in the Arctic up to the present time. The icebreakers that we have now are fairly long legged, as we call it, but they have had an opportunity to come back down for fueling purposes sometime during the course of the operations in the Arctic.

Mr. TOLLEFSON. If there is need for refueling, they have to come down to where?

Admiral GANO. They usually bring them down to Newfoundland in the case of the Arctic.

Mr. TOLLEFSON. Is that much of a trip?

Admiral GANO. Yes, it is. It is approximately 700 miles.

Mr. TOLLEFSON. How long can an icebreaker operate without refueling now?

Admiral GANO. Mr. Tollefson, I will have to supply that. That depends, of course, on the speed that you make with the ship and what use you make of it, but I can give you what we call the radius of operation.

Mr. TOLLEFSON. Would it be a period of months?

Admiral GANO. Yes, sir.

Mr. TOLLEFSON. If there were need for an icebreaker in the Antarctic and the need required that the icebreaker operate there for a period of months, where would it go to refuel?

Admiral GANO. I will have to defer that to the people who operate in the Antarctic, sir; but I believe they look to New Zealand for their base of operations generally.

Mr. TOLLEFSON. I think that is all at the moment, Mr. Chairman.

The CHAIRMAN. Admiral, do you know Rear Adm. George Dufek?

Admiral GANO. Yes, sir; I do, intimately.

The CHAIRMAN. What is your general opinion of a statement he would make?

Admiral GANO. I would consider it very highly, sir, particularly pertaining to anything to do with the Antarctic or Arctic, anything to do with ice.

The CHAIRMAN. Have you had opportunity to read the report he made on June 19, 1959?

Admiral GANO. Yes, sir. I just read it here in the past 2 weeks.

The CHAIRMAN. That is on Operation Deep Freeze, 1958–59, covering operations in the Antarctic.

Admiral GANO. That is correct, sir.

The CHAIRMAN. What is your opinion of the article?

Admiral GANO. Of the article?

The CHAIRMAN. Yes.

Admiral GANO. I think it is well done. I think his points, particularly the one which he made concerning the use of icebreakers, are well taken, sir.

The CHAIRMAN. I want, then, to read into the record an excerpt from his statement:

The only icebreaker to join the U.S. fleet since the war is the *Glacier* and even she is showing signs of her years of hard usage. The *Wind* class vessels cannot last through many more seasons of operation in the summers of both hemispheres with minimum maintenance time between. Timely construction of at least one new icebreaker is imperative. As for design, the general lines

of the *Glacier* are considered excellent, with the reservation that the stern should be modified to provide further protection to propellers. The concept of designing an icebreaker's stern for breaking ice while backing down does not appear sound, especially if it adds even in the slightest degree to propeller vulnerability, the icebreaker's Achilles heel. With rare exceptions, backing in ice is done merely to go ahead again and break a channel ahead; backing is through brash already broken even if congested, and does not require a tapered entering point. The underwater lines of the stern should be broad and bluff, to provide the maximum possible propeller protection and for leaving a clear uncluttered pathway astern for following convoyed ships. As for powerplant, a nuclear powered ship would be most desirable from the point of fuel conservation.

What is your comment on that last sentence?

Admiral GANO. Mr. Bonner, I would say that Admiral Dufek is probably well qualified to make any statement in regard to the use of an icebreaker in the Antarctic. I feel that in his particular position in the Antarctic the need for more endurance which could be provided by nuclear power is probably very, very valid.

The CHAIRMAN. Is there anybody better qualified than he that this committee should call before it?

Admiral GANO. Not that I know of, sir.

The CHAIRMAN. Mr. Miller.

Mr. MILLER. Admiral, you spoke of the fact, which has been brought out, that since the war the only icebreaker that has been delivered is the *Glacier* and apparently the nine ships that have been spoken of were all war babies, built during the war. Is that because of our traditional lethargic attitude toward these things that we wait until we get into war before we start building the tools that we need with which to fight a war?

Admiral GANO. Mr. Miller, as I understand it, the need for icebreakers came up primarily when we went into the Arctic for resupply or certain stations which were necessary during the war, and then later, when the Air Force decided that they needed an early warning line, we worked up along the Alaskan coast and finally the DEW line itself was conceived which gave us a rim along the northern coast of North America. There was then a definite necessity for the stations on the west coast and that is where the greatest need for icebreakers came into effect.

Mr. MILLER (presiding). But, of course, during the early forties when these ships were delivered, we had no DEW line and none contemplated at that time.

Admiral GANO. That is correct.

Mr. MILLER. So it means that we still did wait until we went into war, knowing that we needed these things, and then used that excuse to build some icebreakers, and we have done very little to maintain that fleet since, irrespective of the fact that the need for the fleet is more evident today, because of the DEW line and because of opening the St. Lawrence Seaway, than it has even been in the past, is that correct?

Admiral GANO. That is correct, sir; and I think we have a growing and continuing need for these icebreakers in the future.

Mr. MILLER. As far as we can see now, we are going to need more of them in the future than we have in the past if we are going to expand and maintain the defense installations that we already have established.

Admiral GANO. That is correct, sir; and our future also in the Antarctic.

Mr. MILLER. The question of refueling icebreakers comes up. I do not presume that if an icebreaker is on her station and is half way up into the Arctic that you call her back to a refueling station. You refuel her from a tanker, do you not?

Admiral GANO. That is correct.

Mr. MILLER. So that, with a fleet of icebreakers you have to have a fleet of tankers to supply these ships with fuel that they need about every 30 days.

Admiral GANO. Not every 30 days. I say, they are very long-legged ships but we like to call them back now and then because it gives them an opportunity to get ashore from this arduous duty.

Mr. MILLER. But you do refuel them with tankers?

Admiral GANO. We do not at the present time. We call them back.

Mr. MILLER. You call them back?

Admiral GANO. Yes, sir.

Mr. MILLER. Then that does not require additional ships to service the icebreakers with fuel?

Admiral GANO. Not at the present time.

Mr. MILLER. Do you feel that the nuclear powered ship which would not have to be refueled as often and which would have its own reserve power built into it would be better in this field than conventionally powered ships?

Admiral GANO. I think it is quite obvious, sir, that the nuclear powered ship would be of far greater endurance than the conventional engineering plant.

Mr. MILLER. Mr. Zelenko.

Mr. ZELENKO. Admiral, I would like to get down to the subject of the two bills. As the chairman indicated when we started, Congress last year passed legislation authorizing the building of a nuclear-powered icebreaker which was vetoed by the President on the grounds of fiscal necessity. Coming right down to the subject, I want to go into the money aspect of this, not in detail, but generally. Moneywise, what would be the saving of having a nuclear-powered icebreaker as against building the conventional icebreaker? We need the icebreakers and the lack of them is, of course, deplorable, but I want to try to answer the President's argument. He says we do not have money for this. He might say we have money for conventional icebreakers. Moneywise, how can we save with a nuclear-powered icebreaker as against the conventional ones. Can tell me that generally without binding yourself and having yourself later being confronted with some statement in the record? I do not intend that. I just want your general idea.

Admiral GANO. Mr. Zelenko, I do not feel that I am competent to tell you the difference in cost.

Mr. ZELENKO. I do not mean the cost of it. I mean the general saving. Why should we have a nuclear icebreaker? The President says that costs too much money. I cannot see him saying we cannot build the conventional type of icebreaker, but he says that the nuclear type is going to cost so much money that we cannot afford it; we have to justify the building and operation of a nuclear icebreaker. So that, without going into the operational advantage, I would like to handle this from the viewpoint of trying to convince the President that he is wrong from a money standpoint.

Have you any idea on this subject? That is the reason we are not building one now and do not have one now.

Admiral GANO. Of course, we all know that the nuclear-powered icebreaker costs relatively, I think, about twice as much as a conventional icebreaker and I think it is probably someone's decision to determine whether you want one of a nuclear-power or two of the conventional American type.

Mr. ZELENKO. That comes down to what I am driving at. I am not talking of the original cost. I am talking of the general operational cost because the only way you can figure the cost of a vessel, or any machine, is over the period of its use. It may end up to be cheaper than the one that costs less in the beginning.

Would you say that a nuclear icebreaker over a period of a year would average out its cost against the use of two or more conventional-powered icebreakers?

Do you have any opinion on that subject?

Admiral GANO. I am not an expert in this line but I would think that the nuclear-powered icebreaker would probably cost more in the long run.

Mr. ZELENKO. Can it break ice where the conventional icebreaker could not break ice? Would it have more power?

Admiral GANO. I am sure that a newly constructed ship would have more power, because we do want more power.

Mr. ZELENKO. Could it operate in weather conditions where the conventional icebreaker could not?

Admiral GANO. I do not think that is one of the advantages. The advantage would be its ability to stay longer and do the job longer than the conventional.

Mr. ZELENKO. Of course, if we withdraw the conventional icebreakers from an operation, we, of course, entail a cost in some other direction. That is, being unable to perform a necessary task which would have to be done at a later time which would entail additional costs which would not be reflected in the actual operation.

Admiral GANO. Right.

Mr. ZELENKO. It could do a job quicker, let us say, because it could operate longer.

Admiral GANO. That is correct.

Mr. ZELENKO. It could do a job in emergency conditions which might exist over this greater length of time where a conventional icebreaker would not be able to operate. It might cause, let us say, the necessity of flying supplies or using other routes than water routes where conventional icebreakers might have to be withdrawn, is that right?

Admiral GANO. That is essentially correct.

Mr. JOHNSON. Would the gentleman yield?

Mr. ZELENKO. I yield.

Mr. JOHNSON. In terms of the radius of area of operation, how does the nuclear icebreaker compare with the present conventional type?

Admiral GANO. I would like to defer that to some of the experts here.

Mr. ZELENKO. Now, Admiral, on another phase of this: The Russians, we understand, have a nuclear-powered icebreaker.

Outside of the propaganda advantages, what advantage do they have in having this nuclear-powered icebreaker where we do not have

one? Do you know of any actual advantages which accrue to them because of their ability to have available a nuclear-powered icebreaker?

Admiral GANO. Well, they have, sir, a problem that is probably bigger than we have in the Arctic. They have a longer coastline. They are farther from their bases of operation. They may operate at long distances from any resupply points and I would think that the icebreaker of long legs would be most advantageous to them.

Mr. ZELENKO. So, in effect, the cost from an overall standpoint would average out to be less as against the original high cost of building the nuclear icebreaker?

Admiral GANO. There are those aspects; yes.

Mr. ZELENKO. I have one more question, sir. I think you said that the original reason for the necessity for more and better icebreakers some years ago was the fact that we had established bases in the cold wastes and it was necessary to break open sealanes so that supplies could be brought forward. Then you said the second reason was the establishment of the DEW line so that now we need them for the second reason. I have been reading in the papers lately that some of our nuclear-powered submarines have been poking their noses up in the Arctic. I do not know whether this is so or not, but there would be places where, if the ice were broken, they could operate a little better.

Would there be any connection between a nuclear-powered icebreaker operating longer and farther away and making the use of the Arctic a little easier for our submarines?

Admiral GANO. I do not know whether they would operate together or in unison.

Mr. ZELENKO. Could they open lanes or spaces up there which would make exploration or other uses of your Arctic submarine a little easier?

Admiral GANO. I think that would be possible.

Mr. ZELENKO. I saw the picture in the periodicals recently of the periscope of one of those submarines coming up through the ice. I would not want to damage the periscope trying to come up through the surface.

In a serious vein, do you think that that might assist their activities in certain portions of the Arctic or Antarctic?

Admiral GANO. Yes, I think it might, on the fringes or periphery of the polar pack; yes.

Mr. ZELENKO. I do not mean that they would operate together but, through the activities of the icebreaker ranging far and wide long in advance of necessity in the general operations, they could break open spaces which would be used a short time later.

Admiral GANO. I think that is possible.

Mr. ZELENKO. Do you think that you and your collagues here in support of this legislation could give us, as this thing develops, some valid fiscal reasons to convince the President that he was in error in vetoing this legislation, and perhaps convince him of the merit of this cause? Do you think from what you know of the general tone of the witnesses to follow that perhaps that will come forth from the hearings?

I do not expect that from you.

That is what I am particularly interested in.

Admiral GANO. I think you may find from some of the other witnesses that that will be developed.

Mr. ZELENKO. I would like to suggest, if I may, that, as the witnesses appear, they present us with this evidence which I think we need particularly for this legislation.

Thank you very much.

Mr. MILLER. Mr. Mailliard.

Mr. MAILLIARD. Admiral Gano, to what extent does the MSTS have responsibility in the Antarctic operation?

Admiral GANO. They have none from the responsibility angle. However, we do supply ships for the Antarctic and the numbers of ships and types of ships are tailored directly to the operations that will take place that year.

Mr. MAILLIARD. Aside from turning over the ships, you do not have a similar responsibility as you do in the Arctic?

Admiral GANO. No; for instance, in this next year, we will supply two cargo ships and one small icebreaking tanker and that will be all this coming year in the Antarctic.

Mr. MAILLIARD. The question I wanted to get at, but perhaps it is not fair to put it to you, is that I was wondering, with the plans for Antarctic operations, how much economic value a nuclear-powered vessel might have in wintering over down here just to be used as a powerplant. We were given some figures last year of the cost per gallon of fuel delivered at the Antarctic and it was something almost unbelievable.

I imagine you would not be familiar with those details?

Admiral GANO. No, I am not, Mr. Mailliard.

The CHAIRMAN. Mr. Downing.

Mr. DOWNING. Admiral, I am completely unfamiliar with icebreaker operations. Can you explain how that works?

Do they break ice for each convoy or ship or do they keep a lane open all the time?

Admiral GANO. Speaking of the Arctic alone where my experience has been, normally we try to have our planes find an area of open ice. Before they do that, they make extensive reconnaissance and we find that a lane will develop, through our years in the Arctic, along the western Greenland coast and then, as we go up to the north, this lane of open water and partial ice will develop. We find that, in order to get into a place such as Thule in order to have enough time during the season to do our business, get our cargo discharged, that we must force our way in ahead of season. Therefore, our icebreakers are usually at that spot first in order to get into Thule at a certain date which we have set.

Then on the second phase of the season, we come down along the Labrador coast and the vestiges of ice are usually along the Labrador coast and, in order to force our way into those places where much of our operation is off the beach rather than alongside a pier, the icebreakers are used to break in through this shore ice in order to get our cargo discharged.

Mr. MAILLIARD. Once you break in, do you have to keep going over and over that lane with these icebreakers or does the normal track keep it open?

Admiral GANO. It will depend upon the season of the year. Once we open it we try to keep it open because it is gradually getting better for us, but toward the end of the season the reverse is true and, if we

have to leave our ships in there a longer time, then we must break it open in order to get out. So we keep our icebreakers at the critical time in the opening of the season and toward the end of the season.

Mr. MAILLIARD. Do I understand that you use them mostly in breaking a path from the port to the open water?

Admiral GANO. Yes; that is true in some cases such as Sondrestrom, which is on the coast of Greenland, at the end of a long fiord, and you must break up the ice in this fiord in order to get them out into the clear water of Baffin Bay.

Mr. MAILLIARD. What are we speaking about in distances involved in breaking ice? How many miles would that be?

Admiral GANO. You mean the fiords?

Mr. MAILLIARD. To break ice from the open water to the port.

Admiral GANO. In some cases, in the one that I mentioned, Sondrestrom, it is about 40 miles.

Mr. MAILLIARD. About 40 miles?

Admiral GANO. That is the more difficult type to break because the ice has not any place to go and you have to force it out to a great extent.

Mr. MAILLIARD. Thank you very much.

The CHAIRMAN. Mr. Johnson.

Mr. JOHNSON. I have no questions.

Mr. MILLER. Mr. Chairman.

The CHAIRMAN. Mr. Miller.

Mr. MILLER. How about over on the north coast of Alaska? Do you try to keep that open at all?

Admiral GANO. Mr. Miller, we kept it open during the years 1955, 1956, and 1957. During 1958, the Canadians took over the northeastern part of the Arctic up to Shepherds Bay by resupplying with ships which we lent to the Canadians and are now wintering in the McKenzie River Basin.

The northern coast of Alaska is all accomplished now by commercial barge operations.

There is one icebreaker up there now at this time supporting those ships.

Mr. MILLER. In the event of emergency, you would have to put more activity up there.

Admiral GANO. Yes; I am sure. Remember that the amount of supplies going in there now is very small, very limited, just enough to keep the stations going until the next season.

Mr. MILLER. They are brought in by commercial barge after the ice goes out?

Admiral GANO. That is correct, sir.

Mr. MILLER. In the event of a real emergency, it may be necessary to go up there and resupply these people at earlier times or later times and you would need more icebreakers to do that?

Admiral GANO. That is true, or, if there would be an extension or expansion of the DEW line, which is the Alaskan coast and northern Canada.

Mr. MILLER. Thank you.

The CHAIRMAN. Thank you, Admiral.

Admiral GANO. Thank you.

The CHAIRMAN. We have a large number of witnesses.

I want to hear Mr. Francis Gibbs now so that we will not have to keep him over until tomorrow.

STATEMENT OF WILLIAM FRANCIS GIBBS, NAVAL ARCHITECT, NEW YORK, N.Y.

The CHAIRMAN. Mr. Gibbs, recognizing your outstanding ability in ship design, we would like to have your views on icebreakers and such statement as you care to make about the subject before the committee.

Mr. GIBBS. As you know, Mr. Chairman, I come here as a rule without any prepared statement and today is no exception.

I have heard with intense interest the discussion of the preceding witness' representations. I think the first witness is very sound.

I think the quotations that you read from last year's hearings made by another admiral are also very sound, and what I would like to give you are, the simple principles, you follow when you want to break ice in the Arctic.

The best simple description I can give of it is that it is done by brute strength and awkwardness. There is no easy way to break ice in the Arctic.

Allow me to draw on this experience: We have been fortunate in being connected with the design of all the icebreakers during the war, the *Wind*/class, and with the *Glacier*. Just as one of the preceding witnesses stated, increased power is obviously necessary.

Now, you may recall that during the war we turned over to the Russians some of the *Wind*/class icebreakers. It happens that we attended the return of those icebreakers when they were turned back to the United States and it may interest you all to know that they were turned back in beautiful condition. I do not think we have ever seen better kept ships than these icebreakers were when they were turned back, and the Russian officers on these ships were tremendously impressed with the type of the ships.

The Russians have an interest in the Arctic that I think is even more important than ours. The whole north coast of their country, for many thousand miles, is bounded by the Arctic. They have a great scientific interest in the Arctic.

When I speak about the Arctic, let me also add that any polar region requires icebreaking if you are going to do anything in that particular region.

When the Russians decided to build an icebreaker they made a much larger icebreaker than the *Wind*/class and they made a much more powerful icebreaker than the *Wind*/class. Now, they have had as much experience in the Arctic or more than anybody else. It seems to me that we have only nibbled at the Arctic.

I am out of my scope now as an engineer and naval architect, but no one can say what the end of the cold war will reveal and I would be inclined to think that, if we were building ships, we should build ships that could go anywhere under any circumstances in the Arctic, at least one or two or three as the case may be.

The Russians chose nuclear power for a very obvious reason. They felt that, if they had a large ship, they could improve the habitability of the ship, which is very important on a long cruise in the Arctic; and secondly, they felt that they wanted big power, and they more than doubled the power of the ships that we have. Then they wanted

a ship that, because of this increased power, would be able to do a long period in the Arctic without the replacement of anything because they did not know where they were going to go but they knew they were going to go a long distance in the Arctic.

These conditions are particularly suitable to the use of atomic propulsion.

The Russians do not tell us all they know. I think it is very interesting that we tell them nearly all that we know in accord with the principles of Americans that, if they know anything, they must talk about it. Russians knowing something rarely talk about it and the information that they give us on their ship is fragmentary indeed with respect to the design but we realize it is a very big ship.

One of the advantages of that ship must be the problem of breaking heavy ice and doing it with the aid of some kind of lubricant to get the ship through the ice when it is pushing and breaking down and pushing aside the ice, and I would not be at all surprised, although I do not know, if one of the compelling reasons for a nuclear ship in the Arctic which moved the Russians to adopt that propulsion, although it is very much more costly, was the reason that they could supply a large amount of hot water to help in the proceeding. This is possible with their nuclear ship.

Now, to give you an idea of what this means when you break ice, you can use very simple figures. They are not complicated in any way. You consider the weight of the ship in tons which we always think of as displacement. Displacement and ton weight to us are the same thing but, if you think of the weight of one of these icebreakers and you couple with that the power of the icebreaker, if you multiply those two figures together you get a pretty good measure of the ability of the ship as an icebreaker; or, doing it in another way, you can take the displacement and you can say that for every ton of this displacement or weight we have a certain amount of power in the ship. It may be 2¾ horsepower or something. The power per ton of displacement in the Russian icebreaker, according to the best information, is high, which is consistent with the principles I have described.

Now, when you asked me informally my advice on this subject, I read carefully the hearings of last year and I agree with you that they show a need for icebreakers. It seemed to me essential, not necessarily to outdo the Russians for the sake of outdoing them, but to build a ship that was so powerful and so large that it would have a commanding position with respect to the breaking of ice. If I can simplify this, when you look at the thickness of ice, you need a ship that exemplifies the simple statement of a man doing a boy's job. The ice looks small to a big icebreaker. The ice looks very big to a small icebreaker. In my opinion, those are simple principles that indicate what you have to consider when you want to have an all-purpose icebreaker and, since this icebreaker cannot come into use for 4 or 5 years, as you have said, or longer and if fiscal conditions permit, you have not any idea as you sit here, nor has anybody else, the need for such a ship in the Arctic 5 or 7 years hence.

The Russians have such a ship. It is not as powerful as I think that ship should be if we did it but they certainly have a ship that is a very big advance in icebreaking.

The Russians have great skill in the Arctic and they know more about it than anybody else. They have used our *Wind*/class icebreakers and thought very well of them. As a result of that experience they built a very powerful nuclear ship and it would seem to me very foolish to throw that experience overboard and say, "Let us go on with with little ships."

I think it may be relevant to mention that the history of ships since the world began is from the smaller to the larger. I remember very well being called on some 15 years ago to advise one of the big oil companies about tankers and I said, "Why do you not build very big tankers?" Well, they gave the usual discussion of the difficulty of handling such ships and the difficulty of ports and all the rest. But, 15 years after, they said to me, "We are very sorry we did not take your opinion because we are now building the ships that you suggested 15 years ago."

That is the history of the shipping business whatever branch you go into. If you look at it in the passenger service on the North Atlantic it holds. It holds in cargo ships. You see the speed of ships and that just represents power going up. So it is with icebreakers. But with a precedent before you like the Russians, I do not see how it is possible not to do that thing now which will come into being maybe 6 or more years hence when no one knows the size of the icebreaker you will need and I do not think that it is disadvantageous for us to have a very large icebreaker compared to the Russians. I think that the choice that they have made on the problem of powering it with nuclear energy is a very good precedent because they did not do that for fun. It cost an awful lot of money but in the Arctic and in the kind of ship that we are talking about, that type of power is very important.

Now let me turn for a moment to the problem of habitability. In any icebreaker, but certainly in the big icebreakers like the Russians have, habitability becomes of vital importance. You have a great big crew on such a ship and the Russians will have scientists on their ship. As you know, part of the crew consists of women, and do not think for a minute they are not smart because they are. (They come into New York and we know something about them.) This requires a habitability for long periods in adverse weather with proper heat, proper ventilation, proper recreation spaces, and all. This means a big ship.

In addition, this ship would have to carry a considerable amount of supplies, of oil for any isolated stations, because today you do not know where the stations will be 6 years hence, and also a volume of dry store and the like. So that all these features combined lead one to the conclusion that, when we think about icebreakers today, we have to think about icebreakers 6 years hence not today because they will not be built today. You authorize the ship today and, if you authorize a large icebreaker with nuclear power, it will take a long time to bring it into action and I say that, with these precedents before you, I doubt that anyone would proceed on the large cost of icebreaking in the Arctic without a tool that would be suitable to do the job effectively under the conditions that you might have to face 6 years from today.

I believe that the testimony at the last session and the study that was made then is just as true now as it was then except that nobody

talked much about the icebreaker itself. They talked about the need of an icebreaker. I think the reason why they do not talk about the icebreaker is that you cannot determine the characteristics of a ship, you cannot determine its cost, particularly in such a special ship, without a clear definition of just what is required and, when you picture the processes of the U.S. Government as revealed in Washington, you realize that it is a pretty complicated thing to get a number of agencies in accord on the kind of a thing they want. We do it every day in our naval work and we know the complexity of it and, when you have brooding over it this question of the fiscal situation, it becomes a very complicated thing.

As you know, I told you that I would look into it and I sent down to you a picture of such a ship which is, if I could call it, a pre-pre-preliminary design. It is a big ship. It is a ship that would break thick ice. The picture of it happens to be hanging on the wall of the committee room, and in the particulars of such a ship added to the picture indicate a large icebreaker, an icebreaker that would be superior to the *Lenin* for the uses that the *Lenin* will be put to, and I for one do not know that we will not have to put our ships to some such use.

The only thing I am sure of is that, having as a boy looked at World War I, and then having seen World War II and the possibility of World War III, the conditions, the problems, the needs will be entirely different in World War III than they were in World War I or II. So that, when you are going to develop icebreakers for the Arctic and the Antarctic, I say reverently, for God's sake get something that is of use 6 or 7 years or 8 years from today and can do any job that the Russians can do with their ship and do it better.

Mr. Chairman, that, I hope, is a simple statement and, if I can help you by answering any questions, I would like to do it. I do not pose as a man of much conceit, I am a very simple fellow. Sometimes I feel a little lonely in Washington, but I will do my best with my limited personal capacity.

Mr. MILLER (presiding). Mr. Gibbs, first we want to thank you for coming here and giving of your time not only here but in complying with the request of the chairman of the committee. I want to personally tell you that I always have gotten a great deal out of your testimony before this committee on whatever subject you come here, and that you have given us some food for thought today that supplements that that you gave us the last time we had this subject before us.

I would assume that in building the type of ship that you suggest that is not obsolescent before it is completed that we have an asset that will last us a longer time, too.

In the task of going over ice, I presume that a big ship is not going to be subject to the same wear and tear that a smaller ship would be subject to; is that correct?

Mr. GIBBS. It will put off the obsolescence as long as possible.

May I cite just one example? As you know, we had to do with the design of the steamship *United States*. The *United States* was designed in 1946. Today the *United States* is the most advanced ship in the world in fuel consumption, in speed, in capabilities of carrying passengers, it does better than any other ship in the world the job it has to do. I think the best compliment that it gets is the fact that the French and now the British propose to imitate it. It will take

them about 3 years more in the case of the French and 4 or 5 years in the case of the British, and I would say that the SS *United States* made the kind of advance you ought to make in every important ship you do.

That ship is just as new today as the day it came out. The obsolescence is nothing.

Mr. MILLER. That is a real economy in building a ship?

Mr. GIBBS. Why, of course.

Mr. MILLER. Just as this ship would be a real economy, in my estimation.

Mr. GIBBS. Exactly. But bear in mind, Mr. Chairman, that this requires a broad view of this problem. The great difficulty with technical people is that they dive into a mass of technical detail that I admit freely is beyond me and I assume it would be beyond you.

This is not detail that I am talking. This is the kind of commonsense that, if I sat in a supreme position in the *United States*, I would demand in the kind of a ship that is being talked about here today.

Let us, for God's sake, and say that with humility and great feeling, let us not be behind before we start, and that is exactly what we usually do.

Mr. MILLER. I say "amen" to that.

I notice, sir, that in this picture that you have furnished us and in the proposed detail that you touch something in which I, as the chairman of the Subcommittee on Oceanography of this committee, am very much interested. You propose to make this a multipurpose ship.

Mr. GIBBS. That is right.

Mr. MILLER. One that can do scientific work in the field of oceanography and hydrographic investigations. I know that you, from your long experience with the sea, realize that this is one of the areas that we have hardly scratched and, that if, we are going to go forward, it is an area that we have to know as much about as we know about some of the other land and earth sciences; is that correct?

Mr. GIBBS. There is no question about it and the Russians recognize that and are doing it and have been doing it.

Mr. MILLER. And they are doing it and are doing it in the Arctic area which we have hardly touched.

Mr. GIBBS. That is right; exactly right.

Mr. MILLER. Mr. Tollefson.

Mr. TOLLEFSON. Thank you, Mr. Chairman. I do not know that we have any questions. We do not often have men of Mr. Gibbs' stature and knowledge and experience come before this committee. I hesitate to ask any questions because they would sound foolish. I am perfectly willing to accept his statement that he believes we need this vessel and just stand on that.

Mr. MILLER. You have more humility than I have and I congratulate you.

Mr. GIBBS. May I make a suggestion, Mr. Chairman? I do not think Mr. Tollefson should depreciate the questions that he might ask. If you ever have had children, and some of you may have them, they can tax you with a question and, if Mr. Tollefson in his position, listening on this committee, cannot ask me a question that can stump me, I would be surprised. If I do not know the answer, Mr. Chair-

man, I will tell him so. You will never get me to talk about what I do not know.

Mr. MILLER. I think we realize that, sir.

Mr. Downing?

Mr. DOWNING. I have no questions, Mr. Chairman, except to comment that it is wonderful meeting Mr. Gibbs. I always wanted to meet the father of the SS *United States*, which was built and launched at the Newport News Shipyard which I have the honor to represent.

Mr. GIBBS. That is correct, and well built.

Mr. DOWNING. Thank you.

Mr. MILLER. Mr. Casey.

Mr. CASEY. I have no questions, Mr. Chairman, but I want to apologize to Mr. Gibbs for not being here at the start of his statement. I got a lot out of the last part and I look forward to going back and reading in more detail your statement. I am certainly pleased to see you try to impress all that you can the value of showing farsightedness and not being shortsighted, because I think that is typical not only of the Federal Government, but of some of our local agencies, too.

I had the occasion to take over the construction of a courthouse that someone else built, and before we got it completed, we had to start a second one.

Mr. GIBBS. That is right.

Mr. CASEY. I think we are in a growing age and I think, even though it may appear to some to be a little ridiculous, such as your oil company, for example, in the long run it may prove to be very valuable, and I do not believe that, especially in this field, can we be too extreme. In fact, I think what we ought to do is that, when we think we have reached an extreme point, add another 10 percent to be on the safe side.

Mr. GIBBS. You are exactly right.

Mr. CASEY. I appreciate the sincerity of your statement and I think we shall profit by your years of experience in this field.

Mr. GIBBS. Mr. Chairman, I thought I would read you a very short quotation from the Herald Tribune of February 14, 1959, this year. It is headed, "Three Ships in Trouble in Antarctic Ice."

AUCKLAND, NEW ZEALAND, February 13, by the Associated Press.—Three ships, including the U.S. icebreaker *Glacier*, were reported in trouble today with pack ice in the Antarctic. The *Glacier* and the Belgian supply ship *Polarhav* were having difficulty trying to escape from ice off the Belgian base below South America.

That is the biggest icebreaker we have. That ice that they were in looked very big to that ship.

Mr. MILLER. Mr. Garmatz.

Mr. GARMATZ. I am not on the subcommittee, Mr. Chairman. I am sorry I was not here to hear Mr. Gibbs. I had the pleasure of meeting him on the *United States* a few years back.

I admire you for the good work that you have done and I wish I could have been here to hear your testimony. It is nice to see you looking so well and young and chipper and feeling fine, I hope.

That is all.

Mr. GIBBS. Mr. Chairman, as long as Mr. Garmatz asked about my health, let me suggest to you that I have more fun than any living

man. That is all you need to feel pretty well, as a rule. When I work I count it fun and I usually work 7 days a week, to the horror of everybody including my family.

The CHAIRMAN. Mr. Anfuso.

Mr. ANFUSO. Mr. Gibbs, have you seen the model of the Russian icebreaker at the Soviet exhibit?

Mr. GIBBS. No; I did not. I know you will ask me why.

Mr. ANFUSO. No; I will not ask you. If you do not want me to ask you, I will not. If you want me to ask you, I will.

Mr. GIBBS. I had many men who went to see it but I am not quite as naive as that. If that is the ship as they have it, it would be the first time, would it not, that they ever did anything like that?

Mr. ANFUSO. It would be the first time?

Mr. GIBBS. That is right. I did not think there would be a first time.

The CHAIRMAN. I did not understand what the question was and the answer.

Mr. GIBBS. He asked me, Mr. Chairman, if I went to see the model of the Russian icebreaker in the exhibition of the Russians in New York. I told him I sent men to see it but I do not believe that that ship showed the ship the way it will be. If it did, then it is the first time the Russians ever showed us anything before they completed it and I am not interested in that chance because that is a chance in a million.

Mr. ANFUSO. Mr. Gibbs, I have just one more question.

You know that Admiral Rickover has seen the real ship in Russia. Do you intend to confer with him?

Mr. GIBBS. I doubt it. Admiral Rickover is a very skillful man and I suspect that he would not think my consultation might be worth much to him.

Mr. ANFUSO. To him?

Mr. GIBBS. Yes.

Mr. ANFUSO. Would his consultation be worth anything to you?

Mr. GIBBS. Well, any consultation is worth something to me.

The CHAIRMAN. Mr. Casey.

Mr. CASEY. I have no questions.

The CHAIRMAN. Mr. Johnson.

Mr. JOHNSON. I have no questions.

The CHAIRMAN. Counsel.

Mr. DREWRY. I have a letter from Mr. Athelstan Spilhaus, a member of the Committee on Oceanography of the National Academy of Sciences. He comments in connection with these hearings and makes this statement which I would like to have your comment on. [Reading:]

First of all, I shall go on record as being definitely opposed to the construction of a nuclear-powered icebreaker. Public funds would be more wisely expended by trying to find a better way of breaking ice. Present icebreakers which rely on their ability to crush ice from above are obsolete. I am certain that a better way can be found to break ice, possibly by some type of submarine icebreaker. Such a craft could pass under the ice at leisure and come up through the ice at will. An icebreaker based on this concept would be more effective, and cost less to build and operate than a nuclear-powered icebreaker of more conventional design.

Mr. GIBBS. Mr. Chairman, that is not a subject that I know too much about and, without study, I would not want to give a very definite opinion; but I would say to you offhand that I think the hope expressed in the last line of that statement is a vain hope.

If you are going to do a submarine that will do what this ship shown in the picture on the wall will do, you are going to have an enormously costly ship and I think a ship that cannot do what this does with respect to the large number of people that it would have on board and all the rest of it. The difficulty is simply tremendous in that statement which proposes a submarine icebreaker and I doubt that the people to which you refer are very familiar with the problem from the design standpoint but I am just telling you my untutored opinion. If you asked me the most advanced thing we could do, I would not pursue the submarine method in preference to the precedent that we have with surface icebreakers.

Mr. DREWRY. You would not consider yourself that this is an obsolete vessel up here?

Mr. GIBBS. I think it would be very, very far from an obsolete vessel.

Mr. DREWRY. In making your study you would have examined all available possibilities for performing the function?

Mr. GIBBS. Why, of course. I would examine all means.

Bear in mind that what I have done for you is simply a pre-pre-preliminary study of this subject and obviously it requires a great deal of thought and effort to design an important ship, much more than the average person has any conception of, and you take into account every possibility including a submarine; but I say the problem presented to me by doing this by submarine would be to me an enormous problem.

Mr. DREWRY. That is all.

The CHAIRMAN. Did you make this letter part of the record?

Mr. DREWRY. No.

The CHAIRMAN. I think the entire letter should be put in the record because in the third paragraph of that letter there are several interesting statements and it might cause the Navy to bristle a bit.

How far did you read, Mr. Drewry? He says [reading]:

> The construction of a nuclear-powered icebreaker is just about as useless as the construction of a nuclear-powered aircraft carrier. Putting a modern nuclear-power plant on an obsolete device like an aircraft carrier does not make it modern. The aircraft carried on a carrier still have to be powered by conventional fuels. It is this necessity which limits the effective range of the whole system. Likewise, weight and horsepower limit the effectiveness of conventional icebreakers.

Mr. GIBBS. I know of no limit.

The CHAIRMAN. Of course, this committee is looking for all the enlightenment—certainly I, as chairman, am. The committee was convinced last year that we were right in reporting out the bill and the veto message only applied to the lack of funds we had in the United States to do business with.

Mr. GIBBS. Who is the authority that signed this letter?

The CHAIRMAN. Let me finish.

The picture going on in our country is that we are giving away everything we have to somebody else and the picture points to the time that is coming when we will not have anything to give away

to those people we are trying to save by our present generosity. I wonder sometimes where we are going to be.

Mr. GIBBS. Mr. Chairman, that is beyond my knowledge.

I admit that I have often asked myself: Where are we going? and I think any citizen of the United States might ask the same question and have great difficulty in getting it answered.

The CHAIRMAN. I have the greatest respect for the gentlemen that wear the uniform of this Nation, particularly the Navy, and this question of submarines coming up and breaking ice was raised on the floor of the House when we had this icebreaker bill over there.

I have tried to get some information from the Navy as to whether the system of icebreaking can be changed from a surface ship to the underwater ship. I talked to one prominent naval officer and he cited the incident of one of our submarines that did come up and had some difficulty with the superstructure and so forth.

That is an interesting letter and comes from an outstanding gentleman.

Mr. GIBBS. Who signed the letter?

The CHAIRMAN. Athelstan Spilhaus.

Mr. DREWRY. He is the dean of engineering at the University of Minnesota, a member of the National Academy of Sciences Oceanography Committee.

Mr. GIBBS. Mr. Chairman, I think you can definitely say in this world that you can accomplish almost anything if you are given money enough, you see, but this problem that he poses there will take an awful lot of money.

The CHAIRMAN. Are there any further questions?

Mr. Gibbs, we certainly appreciate the giving of your valuable time to the enlightenment of this committee.

Mr. GIBBS. It is a great pleasure to be here, Mr. Chairman, before this distinguished committee and do what I can to help you.

The CHAIRMAN. Thank you very much, sir.

We will hear now Admiral Donaho, Director, Logistics Plans Division, Office of Naval Operations.

We appreciate your being with us and advising us, Admiral.

Admiral DONAHO. Thank you, sir.

STATEMENT OF GLYNN R. DONAHO, REAR ADMIRAL, U.S. NAVY, DIRECTOR LOGISTIC PLANS DIVISION, OFFICE OF THE CHIEF OF NAVAL OPERATIONS

Admiral DONAHO. Mr. Chairman, I have a prepared statement which I shall read with your permission, sir.

Mr. Chairman and members of the committee, I am Rear Adm. Glynn R. Donaho, Director, Logistic Plans Division in the Office of the Chief of Naval Operations. I appreciate the opportunity to appear before the committee during your consideration of H.R. 4.

The Navy knows the requirements for icebreakers and the need to replace certain ships now in operation with new and modern types. There are insufficient icebreakers available to the Navy and the Coast Guard to carry out the many tasks requiring the services of this specialized type of ship. The future of nuclear power as a means of ship propulsion is acknowledged and in view of its responsibilities

relative to design and construction standards for merchant ships, the U.S. Coast Guard should have the opportunity to acquire the technical and operational experience associated with nuclear propulsion.

Whereas the collection of scientific data in the polar regions continues to be important to the military and to the scientific community, the need for a nuclear-powered icebreaker to perform this function has been somewhat diminished by the successful operations of our nuclear-powered submarines in the Arctic.

From a purely military point of view the Navy believes that nuclear propulsion should be adapted first to combatant ships because of the tactical advantages that accrue from the use of nuclear power. The advantages of practically unlimited endurance, while admittedly important in icebreaker operations, are not as great for that type of ship as for submarine and surface combatants. Navy experience has been that the fuel characteristics of conventionally powered icebreakers have not been their limiting feature. Instead, hull and propeller damage has caused the major logistic problems in icebreaker operations.

Faced with obsolescence of many of its ships, combined with the current high costs of modern electronic and weapon systems, the Navy has been forced to defer plans for incorporation of nuclear propulsion in many of the new combatant ships. Therefore, we would not apply nuclear power to Navy icebreakers until higher priorities of the fleet have been satisfied.

In view of the foregoing the Navy, on behalf of the Department of Defense, neither opposes nor supports enactment of H.R. 4.

That concludes my prepared statement. I have with me Capt. H. S. Hamlin from the Fleet Operations Division, and Capt. F. T. Cooper from the Atomic Energy Division, both in the Office of the Chief of Naval Operations. We are at the disposal of the committee to answer any questions you may care to ask.

If they may come forward, sir.

The CHAIRMAN. Admiral, as I said in the beginning, we are seeking enlightenment. We appreciate the time you gave and your staff gives to this subject.

I have been around the Capitol for a long time and I have for a long time been interested in the Coast Guard. It is a great service, an outstanding service, one that is close to me. It just seems to me that the Coast Guard is just kind of withering on the vine. I do not know the reason. I do not know if it is due to the position it is in, that the Treasury Department naturally does not have the interest that the Defense Department has. Yet the Coast Guard is under the Navy and Department of Defense in time of emergency and the directive is that the Coast Guard should stay in the status of readiness all the time for that purpose.

In getting around and observing their equipment, ships and other things that they have, it is apparent to a layman that, if they were in the Defense Department, there would be no question raised about the funds necessary to place the Coast Guard in a position to carry out the functions that are delegated to them by Congress.

In my way of thinking, it is a serious situation.

I think the gentleman in command of the Coast Guard is one of the finest officers and finest citizens I have ever had the pleasure of knowing, and I can appreciate the position he is in.

You people in the Defense Department can come down and just open your mouths and the Secretary of Defense supports you. I, from observation, am beginning to believe that the Coast Guard is afraid to say much in defense of what they need.

This is the first time I have ever made such a statement as this. Many times it has been suggested that the Coast Guard be transferred from the Treasury to some other agency. I know there is a fine gentleman who is Secretary of the Treasury and I had an opportunity to visit him the other day. I more or less told him some of the things I have said here.

It does concern us. If the Coast Guard is going to be delegated to icebreaking, it is high time they were getting some new icebreakers of one type or another and this committee was thoroughly convinced that this would be the proper field for it to venture into. The veto message did not say that this ship was not needed and that it should not go into the field but stressed the fact that we just did not have the money. The crumbs that fall from the other national defense agencies would boost the Coast Guard substantially, in my opinion.

So I am rather disappointed that the Navy does not say one thing or the other. You neither oppose it nor do you support it. You leave us in a vague atmosphere as to whether we are wasting our time in this committee. All these men have other things to attend to but this committee was convinced that we should go into this field.

This statement sort of nonplusses me. Does it mean that the Navy should build this type of ship and take over the icebreaking or that the Coast Guard should continue to be delegated with the responsibility of breaking ice in time of peace and in time of national strife?

Admiral DONAHO. Mr. Chairman, we have a need for icebreakers. We support icebreakers but we have a priority within our sphere of interest in the national defense in seeing that such moneys as might be available for nuclear propulsion go in our combatant ships. We do not propose to put nuclear propulsion into our auxiliaries until such time as, shall I say, nuclear propulsion is compatible with conventional fuels for propulsion.

The CHAIRMAN. I do not disagree with your putting everything possible into the national defense, but I still come back to the position that I do not know what is going to happen to the Coast Guard if they collapse and then are called on to come in, and they find that they are short of equipment.

I have seen some of the vessels that they are operating, built in World War II, where it takes about half of the time of the crew to keep them afloat.

Admiral DONAHO. Mr. Chairman, if I may amplify, we do neither oppose nor support this particular bill for nuclear propulsion. We do know that we need icebreakers.

The CHAIRMAN. May I say this. I think it is fair that I say it. It was intimated to me, and the intimation was instrumental in my calling these hearings, that the Navy would come up with a different view on this subject than they did last year. That was intimated to me. Now I find that the Navy has about the same position, and I do not know what it is that they did have in the previous hearings. You kind of leave me without a rudder.

I do not think it is fair for any branch of the armed services to experiment in this field if it is valuable and not let another branch go forward in this field. It is all more or less experimental.

Our effort with respect to the *Savannah* was experimental. We knew that it was the first beginning in this type of utilization of a new power and, until we begin it, we will never develop it. If we do not try to develop it we will just be caught unprepared.

Admiral DONAHO. If I may refer back to my statement, sir, the responsibilities of the Coast Guard to our merchant marine require that they do have that technical knowledge.

We are merely taking the position, sir, that at this time the limited funds available for support of the national policies are such that, in our opinion, we would not put nuclear propulsion in an auxiliary. We would put them in our combatant ships.

The CHAIRMAN. And the Coast Guard turns around and says they have so many other things that they need money for that they would rather have this money in things that they are just simply bound to have.

I imagine that is about the position of the Coast Guard. Yet this committee has the responsibility to the American merchant marine and to the national defense, and so forth. I find myself in a rather peculiar position to offer this bill again to the House and to the Senate.

Mr. Tollefson?

Mr. TOLLEFSON. Admiral Donaho, if I understand your statement, you are saying that so far as the Navy is concerned, they have priorities which cause them to take the position that for themselves they would not put nuclear power into an icebreaker that they might build or into an auxiliary vessel.

Admiral DONAHO. That is correct, sir.

Mr. TOLLEFSON. I hope you are not saying that the Coast Guard should not have a nuclear-powered icebreaker?

Admiral DONAHO. Not in the least, sir.

If I may repeat, sir, it is necessary that the Coast Guard become technically acquainted with the requirements which are under their responsibilities in connection with the merchant marine.

As you know the NS *Savannah* has a nuclear plant. There is a proposed bill for another nuclear plant and both are part of the pattern which makes it necessary that the Coast Guard have some knowledge of nuclear propulsion.

Mr. TOLLEFSON. If the Coast Guard were to utilize nuclear power in any of its vessels, would an icebreaker be the most likely vessel for them to experiment with?

Admiral DONAHO. I would defer that to the Coast Guard, sir, because I can only comment from the priorities we would give it within the Navy.

Mr. TOLLEFSON. But you do feel that the Coast Guard ought to have some experience with nuclear-powered vessels?

Admiral DONAHO. I most assuredly do, sir.

Mr. TOLLEFSON. It may be that the Coast Guard might have better ideas than you as to where they would employ that nuclear power, but would you not have some personal idea that maybe an icebreaker would be the best means of utilizing nuclear power as far as the Coast Guard is concerned?

Admiral DONAHO. From the operations of our icebreakers, sir, we would not put nuclear propulsion in them.

Mr. TOLLEFSON. You have combatant ships.

Admiral DONAHO. From the operating experience we have had with icebreakers we would not put a nuclear propulsion plant in an icebreaker, sir.

Mr. TOLLFESON. Just following that up, why?

Admiral DONAHO. Mr. Chairman, I have with me Captain Hamlin, who is the ex-commanding officer of the U.S.S. *Staten Island.* He is also in the Operations Group and has the desk that covers the Arctic operations for the Chief of Naval Operations. With your permission, may he answer some of these questions that are directly related to icebreaker experience, what our concepts of icebreakers are, how we operate them and how we plan for them, sir?

Mr. TOLLEFSON. I just had one more question to ask of Admiral Donaho. It is a reiteration, of course, but it is clear from your point of view that we do need additional icebreakers?

Admiral DONAHO. Yes, sir.

Mr. TOLLEFSON. I think that is all.

The CHAIRMAN. Do you want to ask questions of the admiral?

Mr. MILLER. Yes, sir.

The CHAIRMAN. Certainly we do not want to go without the knowledge of the gentleman referred to.

Mr. TOLLEFSON. Would the gentleman from California permit me to make another statement?

Mr. MILLER. Yes.

Mr. TOLLEFSON. With deference to every other representative of the Defense Departments who have very fine representatives, I do want to subscribe to what our chairman has said about the Commandant of the Coast Guard. I subscribe most heartily to his views about Admiral Richmond.

That is all.

Mr. MILLER. I join you and the chairman in that, too.

Admiral, you heard quotations read from the statement made by Admiral Dufek here today. Do you subscribe to the fact that Admiral Dufek is qualified to make such a statement?

Admiral DONAHO. We have the greatest respect in the Navy for his experience in Arctic operations.

Mr. MILLER. Are there any other people who have as much experience as he has or who are better qualified than he to make such a statement?

Admiral DONAHO. No, sir.

Mr. MILLER. You say that it is the Navy's experience that fuel characteristics are not the limiting feature. What are the limiting features in icebreakers?

Admiral DONAHO. Damages to propellers, to hull, and other common logistic items, such as food.

Mr. MILLER. If, as has been suggested by Mr. Gibbs, whom I know you recognize as qualified in this field——

Admiral DONAHO. Eminently so, sir.

Mr. MILLER. Admiral, if we can develop these by souping up a ship that is designed and capable of doing this job, would you not eliminate some of those damages?

Admiral DONAHO. Admiral Dufek, if I may say so, sir, is speaking from his experience in his particular area of responsibility. The position I presented here is the overall position of the Navy.

Mr. MILLER. I appreciate that. That just says that you do not want to answer that question and I can appreciate your reluctance to do it because it is not very well in keeping with the statement that you have to come here and give us on behalf of the Navy.

Admiral Gano told us that you bring these icebreakers back to port and he cited one of the reasons, that you give some leave and to get away from the closeness of the confinement, you cannot keep them out at sea. Those reasons hold in time of peace and I accept them, but we are planning beyond that. We are looking to a type of conditions where you have to get up to the north coast of Alaska or have to get to one of these places. Could we not keep a nuclear icebreaker operational with greater facility than we could a conventionally powered ship that would then require at least almost the services of an oil tanker to keep her fueled up?

Admiral DONAHO. If ships can be designed when hulls are more durable than they are now, and when propellers will not get damaged, and when the morale of the crew is indefinite and where other common logistic items are infinitely available, I would say yes, sir.

Mr. MILLER. Well, of course, I am conscious as you are that during World War II we based our fleet at sea, did we not, and under the press and stress of war we kept men out on those ships much longer than we do under normal conditions. Is that not true in all times when you are in the face of an enemy?

Admiral DONAHO. Yes, sir.

Mr. MILLER. That we have to disregard those standards that we maintain in peacetime?

Admiral DONAHO. That is right, sir.

Mr. MILLER. The men that are in the trenches are pulled in and out of the trenches and returned to them and the enemy attacks when those men should be having rest.

We are very proud of the fact that we based our fleet out in the middle of the Pacific, are we not? Maybe you had a good part in that operation. Is that right?

Admiral DONAHO. Sir, I have been submerged in a submarine 72 days without seeing the sun. I know what you are talking about.

Mr. MILLER. And it does hurt your morale. Is this not a part of the same thing? Is this not a part of the preparation for war? Is is not time maybe that in this particular phase we give some consideration to experimenting to make sure whether it is right or wrong and give the Coast Guard a nuclear powered icebreaker that is designed, as Mr. Gibbs said, to be one that is not going to be obsolescent for 5 or 6 years which perhaps, like the *United States*, will live up to her age in the same way that that ship has in the passenger field?

Admiral DONAHO. Mr. Miller, if you will let me repeat, sir, if we had unlimited funds to experiment with, we would continue to experiment, and put nuclear powered propulsion in some of our smaller combatant ships.

Mr. MILLER. But if the Navy did that it would do it in its smaller combatant ships and the matter of an icebreaker would be put into second category.

Admiral DONAHO. We have auxiliaries which include oilers, fresh provision ships, dry provision stores, and aviation spare parts. They are part of our auxiliaries the same as icebreakers are, and the same as some other ships that are at sea.

Mr. MILLER. This committee has no authority over combatant ships of the Navy. We recognize that limitation but I am very happy to see this committee and its Chairman forcibly going into this field just as we had to force the hand to get into the commercial field with the *Savannah*. We have discussed informally the matter of putting nuclear power into tankers and I think when war comes, if we may pioneer and get a nuclear powered tanker and a nuclear powered icebreaker for you that the Navy will be very quick to use them and the Navy will be very quick to take credit for doing the thing. I think, frankly, the Navy is dragging its feet in this field right now.

That is all, Mr. Chairman.

The CHAIRMAN. Mr. Mailliard.

Mr. MAILLIARD. No, I have no questions.

The CHAIRMAN. We have a good witness here.

Mr. MAILLIARD. We have an excellent witness.

The CHAIRMAN. Mr. Casey.

Mr. CASEY. You say, Admiral, that you recognize the need for additional icebreakers. Who should get them? Regardless of the type of propulsion, who should have them?

Admiral DONAHO. The Navy has in its shipbuilding program a requirement for two additional icebreakers, a large one, and a shallow one. I do not know what the Coast Guard requirements are. We have our respective shipbuilding programs. I can only speak for our own requirement.

Mr. CASEY. The Navy has two on the books, so to speak, for building?

Admiral DONAHO. Yes, sir.

Mr. CASEY. You say one large one?

Admiral DONAHO. Yes, sir.

Mr. CASEY. How large an icebreaker is that?

Admiral DONAHO. I will have to supply that for the record unless you allow me to ask Captain Hamlin, who handles that portion of our program. I can supply it for the record, sir.

Mr. CASEY. You can supply it for the record if you would, please.

(The information referred to follows:)

The large icebreaker will have essentially the characteristics of the U.S.S. *Glacier* (AGC–4); length 310 feet, beam 74 feet, draft 29 feet, full load displacement 8,740 tons, shaft horsepower 16,000.

Mr. CASEY. What type of power is going to be in those two ships, sir?

Admiral DONAHO. Conventional sir. They are low on the priority list. We still need combatant vessels.

Mr. CASEY. How many icebreakers does the Navy have now?

Admiral DONAHO. We have five, sir.

Mr. CASEY. You have five. Will this add to your fleet of five icebreakers or are you retiring two?

Admiral DONAHO. No, sir. We do not have any at the statutory age of 20 years at this time.

May I ask the officer in charge of this desk at OpNav to supply this information?

Mr. CASEY. Go ahead.

The CHAIRMAN. We are going to hear this gentleman.

Admiral DONAHO. I will supply that for the record.

(The information referred to follows:)

Since most of our current icebreakers would be over 20 years old by the time our planned new construction ships joined the fleet, it is probable that we would retire two of the oldest to accommodate the two new ships.

The CHAIRMAN. I must adjourn the meeting but I want to make one more observation.

In the letter we got from the National Academy of Sciences, signed by Mr. Spilhaus, he is opposed to icebreakers.

Then he says: "Putting a modern nuclear powerplant on an obsolete device like an aircraft carrier does not make it modern."

You are opposing the icebreaker but you advocated the power in an aircraft carrier, I understand, did you?

Admiral DONAHO. Yes, sir.

The CHAIRMAN. What do you think about this man's statement here?

Admiral DONAHO. I disagree with it, sir.

The CHAIRMAN. You disagree with his statement with respect to an aircraft carrier?

Admiral DONAHO. Being obsolete, sir.

The CHAIRMAN. But you join him in his statement with respect to an icebreaker?

Admiral DONAHO. No, sir. I disagree with his statement.

The CHAIRMAN. He says both are worthless.

Admiral DONAHO. I think his comparison is incorrect, sir.

I do not think they are two of the same kind. An aircraft carrier requires the legs and the endurance to get close to an enemy coastline. This is not point to point work, and they are a long time at sea.

The CHAIRMAN. Do you not think icebreakers need any endurance?

Admiral DONAHO. There are other factors, sir.

The CHAIRMAN. You put the word "endurance" there.

Admiral DONAHO. There are other factors which limit the endurance of icebreakers besides fuel.

The CHAIRMAN. Thank you, Admiral. I imagine the captain will be around so we can question him.

Admiral DONAHO. Yes, sir.

The CHAIRMAN. He knows whether you break ice with a submarine or an icebreaker and which is the best, does he?

Admiral DONAHO. Yes, sir.

The CHAIRMAN. We will have him tomorrow morning at 10 o'clock.

(Whereupon, at 12:05 p.m., the hearing was adjourned to reconvene at 10 a.m. Friday, August 14, 1959.)

NEED FOR COAST GUARD ICEBREAKERS

FRIDAY, AUGUST 14, 1959

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MERCHANT MARINE
OF THE COMMITTEE ON MERCHANT
MARINE AND FISHERIES,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to adjournment, in room 219, Old House Office Building, Hon. Herbert C. Bonner (chairman) presiding.

Present: Representatives Bonner, Miller, Zelenko, Downing, Tollefson, Ray, and Pelly.

Staff members present: John M. Drewry, chief counsel, and William B. Winfield, chief clerk.

The CHAIRMAN. The committee will come to order.

The first witness this morning will be Captain Metsger.

STATEMENT OF CAPT. A. B. METSGER, DEPUTY AND ASSISTANT CHIEF OF NAVAL RESEARCH; ACCOMPANIED BY DR. A. E. MAXWELL, OFFICE OF NAVAL RESEARCH, DEPARTMENT OF THE NAVY

Captain METSGER. It is an honor to be here this morning, Mr. Chairman, and for the Chief of Naval Research and the people of our Office of Naval Research, I would like to say that we have great appreciation for the interest of this committee in oceanography and in fact in the whole field of research and particularly your interest, Mr. Chairman, which I think is a great help to our whole efforts in oceanography.

I am Capt. A. B. Metsger, Deputy Chief of Naval Research, and it is my privilege to present this paper this morning, if you would, sir.

The Department of the Navy has in the years since the last war used icebreakers of the *Wind* class for research purposes in Arctic and Antarctic waters. In general this use has been on a "not to interfere basis" since the icebreakers have always been employed on resupply missions for our bases at either pole. The data which have been collected on these missions, while unique, have not been too satisfactory for research purposes because of their scarcity, and because of the conditions under which they were collected.

The Hydrographic Office has found icebreakers useful in their ice prediction and survey work, and have continued to man the icebreakers employed on IGY resupply work at the South Pole with scientific personnel. Bottom soundings have been taken along the resupply routes, hydrographic casts have been made where possible,

temperature measurements have been made, and water samples have been collected. All of the work has been on a not-to-interfere basis, which for survey work as well as for scientific research has not been too satisfactory.

For deep ocean work in the Arctic, the Navy has felt for some time that more useful results could be obtained through the employment of under ice submarines, and by use of aircraft which fly from station to station over the ice. The advent of the nuclear-powered submarine makes possible long cruises under the ice into areas which would not otherwise be accessible even to a nuclear-powered icebreaker. Two such cruises have been made by the *Nautilus* and the *Skate*, and the Navy has sponsored two expeditions to the Arctic which employed aircraft making oceanographic stations. Scientifically and operationally both of these types of activity have been satisfactory.

Present icebreakers are not designed for research purposes. As heavy ships designed to clear ice out of the way of convoys and for keeping harbors and lakes open during the winter months, there is very little space available for the installation of research laboratories and scientific equipment. On the other hand, whenever icebreakers have gone to out of the way parts of the world, the Office of Naval Research in cooperation with the Hydgrographic Office, has always tried to supply scientific personnel in order that some information could be collected.

If a nuclear-powered icebreaker were to be constructed it would be our plan to request that space be made available for scientific purposes. In that case it is estimated that space would be needed for a maximum of 12 scientists and about 1,500 square feet which would include space for portable scientific equipment. However, it is pointed out the ship would not be useful enough to science so that its construction could in any way be justified for science alone.

The Soviet Union has long employed icebreakers along their northern sea route for commercial purposes. They have also constructed a nuclear-powered icebreaker, the *Lenin*, which presumably would be used along the northern sea route. It is not known whether scientific research is conducted on board these ships, but undoubtedly they take observations which can be used by scientists.

That is the end of my statement, sir. I would be most happy to respond to any questions which I am able to answer.

I have brought with me, Dr. Arthur E. Maxwell, a distinguished oceanographer on the staff of the Office of Naval Research. Perhaps he, too, may be helpful.

Could he move up here, sir?

The CHAIRMAN. Yes. Any of the gentlemen accompanying you may come up.

Mr. Downing, do you have questions?

Mr. DOWNING. Yes.

Captain, you are the head of the Oceanography Section of the Navy; is that correct?

Captain METSGER. Mr. Downing, the Office of Naval Research is responsible for the oceanographic research in the Navy.

Mr. DOWNING. And you think that this nuclear icebreaker would be a very valuable place to have a laboratory incidental to the oceanography research. You say it would not justify it for your laboratory alone but you would like it on the icebreaker; is that correct?

Captain METSGER. It would be useful to have such a laboratory and it would be our plan to request that limited facilities be provided in the design.

Mr. DOWNING. Are you engaged in any active research now in New Orleans?

Captain METSGER. The Office of Naval Research conducts the major portion of the oceanographic research accomplished in this country. We administer it.

Mr. DOWNING. Briefly, what are you doing in that line?

Captain METSGER. I think this would be a good time to ask Dr. Maxwell to make a short statement, if you would like to have him do so. He does in fact manage this program.

Mr. DOWNING. He is the man who actually does? I would like to hear Dr. Maxwell.

Mr. MAXWELL. Mr. Downing, our oceanographic program, as such, is a very broad program. We cover nearly all aspects of research on the ocean from a very broad point of view from the basic research on through applied research and this research is covered in all areas of the oceans including the Arctic and Antarctic, although at the present time our largest share of the program is not in the polar regions. The types of work which we do are measurements, such as temperature measurements, current measurements, the interaction of the atmosphere, and the oceans looking into the resources of the sea and various general types of measurements of this sort.

Mr. DOWNING. Have you found any new resources in the sea?

Mr. MAXWELL. Yes, sir; many new resources have been found. I think the most promising is perhaps the finding of a large amount of mineral deposits on the ocean bottom, manganese nodules, which are known to cover large areas of the ocean floor.

Mr. DOWNING. Do you think you will be able to recover them in commercial quantities?

Mr. MAXWELL. They are available in commercial quantities.

The question of being able to recover them economically is being looked into at the present time. It is still an open question.

The CHAIRMAN. You testified, Doctor, before the Oceanography Subcommittee of this committee on the subject you are now discussing, did you not?

Mr. MAXWELL. Yes, sir. I have been before the subcommittee.

The CHAIRMAN. This hearing is primarily for the purpose of seeing what advantage this icebreaker, if it came into being, would be to all the segments of your study and other studies.

I think you testified originally on the icebreaker last year, did you not?

Mr. MAXWELL. No, sir. I did not.

The CHAIRMAN. Go ahead.

Mr. DOWNING. I did not mean to take the committee's time but asked that just as a matter of interest, Mr. Chairman.

Do you think it would be desirable to have a laboratory on a nuclear icebreaker?

Mr. MAXWELL. Yes, sir. If such an icebreaker is built we would certainly like to have space and be able to put scientists on board to make observations in the areas to which the icebreaker would go.

Mr. DOWNING. Thank you very much.

The CHAIRMAN. Mr. Tollefson.

Mr. TOLLEFSON. Captain, I did not hear your full statement since I was delayed. Do I understand that it is your feeling that an atomic icebreaker might be desirable but it is not essential so far as the Navy is concerned?

Captain METSGER. I would rather defer to Admiral Donaho on that for the overall Navy, sir.

Speaking from the point of view of the Office of Naval Research, we could not justify the construction of such an icebreaker.

Mr. TOLLEFSON. If one were built, you would like to see on it the facilities for research?

Captain METSGER. Yes, sir. We would.

Mr. TOLLEFSON. That is all, Mr. Chairman.

The CHAIRMAN. That was contemplated in the bill that was reported out in the report on the bill last year.

Mr. Ray?

Mr. RAY. I have just one or two questions.

Do you have research facilities on any of the existing icebreakers?

Captain METSGER. No, sir. We do not have facilities aboard.

Mr. RAY. Could you have it?

Captain METSGER. The icebreakers are so small and dense, the space is so taken up with their fundamental requirements, that there is not good space available for scientific effort, sir.

As we have said, we do send scientists on specific trips on icebreakers and make do with what is available.

Mr. RAY. That is all, Mr. Chairman.

The CHAIRMAN. Mr. Pelly.

Mr. PELLY. Captain, the Navy now has a projected program to build 18 research vessels over a period of 10 years, is that correct?

Captain METSGER. We have a program to build research ships over such a period, sir.

Mr. PELLY. If that program were developed, would any of those research ships be of the character to go up into the northern waters and to do any of the work that might otherwise be done on the icebreaker?

Captain METSGER. None of these ships would be icebreakers but they could operate as other ships do in the presence of ice when supported by an icebreaker when that is necessary.

Mr. PELLY. Would it be advantageous to have with one of those research vessels an atomic icebreaker that could keep the ice open and stay up in the ice for long periods of time and not have to come back to refuel or have other supply problems?

Captain METSGER. I do not feel we could justify such a service, sir.

Mr. PELLY. Captain, your testimony was to the effect that you would find it more advantageous to utilize nuclear submarines; is that correct?

Captain METSGER. Yes, sir.

Mr. PELLY. The difference in cost between a nuclear submarine and an atomic icebreaker would be something like $20 million. Would that be a pretty good guess?

Captain METSGER. I am not an authority on this.

Mr. PELLY. The cost of an icebreaker would be around $30 million?

Captain METSGER. I do not know, sir.

Mr. PELLY. Is there any means which you have of putting your research scientists on to nuclear-propelled submarines?

Captain METSGER. Again, the nuclear-propelled submarines and other submarines are dense, have little space available, but we do put scientists aboard for such runs as we have had under the North Pole, again to make do with whatever is available.

Mr. PELLY. If it is impracticable to put scientists on to a conventional icebreaker, I assume that it is highly impractical to find the space to put them on any type of submarine, either standard propulsion or atomic propulsion.

Captain METSGER. We have put them aboard on both types of ships.

Mr. PELLY. You could not use it as a scientific laboratory to any degree?

Captain METSGER. They are useful, yes, sir.

Mr. PELLY. Would you say that it would be impractical to build a nuclear submarine for purely scientific purposes?

Captain METSGER. When the question of cost and diversion of our assets is taken into account, it would be impracticable.

Mr. PELLY. In other words, the only practical means of getting some of this scientific data is to allocate the scientific work as part of the justification for the cost of construction and to allocate the remaining cost of construction to useful essential work, such as icebreaking, to divide the investment between the two objectives?

Captain METSGER. We feel that we could make no significant contribution to justification, sir.

Mr. PELLY. Thank you.

The CHAIRMAN. Mr. Miller.

Mr. MILLER. I have no questions.

I am glad to see Captain Metsger and Dr. Maxwell here. I am very much interested in the questions that have been asked.

I will pass for the time being.

The CHAIRMAN. Mr. Zelenko.

Mr. ZELENKO. I have no questions.

The CHAIRMAN. Counsel.

Mr. DREWRY. Captain, when you referred, in response to Mr. Pelly, to the diversion of funds, you are talking in terms of what the Navy's position would be?

Captain METSGER. Yes, sir.

Mr. DREWRY. It would be solely Navy?

Captain METSGER. Yes, sir.

Mr. DREWRY. You would not object if some other agencies were to proceed with the nuclear research submarine?

Captain METSGER. This type of research, sir, is the responsibility of the Navy Department and it is so tied in with the security of this country at sea that all this work should be and must be done by the Navy.

Mr. DREWRY. To what type of research are you referring?

Captain METSGER. The type of work that would be done by a research submarine. This is particularly good for working under the ice. This type of work must be done by the Navy because the Navy is the prime consumer of the data which result.

Mr. DREWRY. At the present time?

Captain METSGER. At the present time and as far as I can see, Mr. Drewry.

Mr. DREWRY. Can you do biological research with a submarine as well as matters such as charting and mapping?

Captain METSGER. Yes, sir. We can do biological research with the submarine and would normally be expected to do such work. We do a great deal of this work all through the ocean areas of interest to the country in a military sense.

Mr. DREWRY. What do you mean by a "not-to-interfere basis"?

Captain MEGSGER. The icebreakers which we have or which one perhaps would foresee will be so urgently required for normal icebreaking duties that their tracks, their operations will be dictated by those duties, and that is the way it typically is. In the past, when these requirements sent the ships to out-of-the-way parts of the world where we need data, we would put a scientific team aboard to get the data as the ship was doing its regular job. This is a very inefficient way of using scientists normally so that, in most trips, you would not expect to have scientists aboard.

Mr. DREWRY. That is with the present icebreakers, and are you referring to Navy icebreakers or both Navy and Coast Guard?

Captain METSGER. At the moment, I am thinking particularly of Navy icebreakers.

Mr. DREWRY. You heard yesterday that there is a need for additional icebreakers. Admiral Donaho said that we were deficient in quantities of icebreakers at the present time, is that correct?

Captain METSGER. I believe I recall that Admiral Donaho said that, sir.

Mr. DREWRY. And he spoke of the age, I believe, of the existing fleet, putting the Navy and Coast Guard together.

While the use of scientists in connection with present icebreakers on a not-to-interfere basis may be very inefficient, as it sounds to be, is there a prospective use so that if additional icebreakers are built, whether they are atomic powered or otherwise, advantages could accrue from having them specially designed, and having included in the planning arrangements to avoid this not-to-interfere business so that an icebreaker could be allocated for a solely research project occasionally?

Captain METSGER. This would be useful, sir, very useful.

Mr. DREWRY. The point I am getting at is that last year when this legislation came up, I do not believe that it was the committee's feeling that any one of the two or three uses that it would have would in itself justify building an atomic icebreaker, but, added together, that by building in research capability and by building in the endurance and by having an opportunity to move another step along in the development of nuclear propulsion for noncombatant surface ships, that there would be an overall value in the national interest that would make the project well worth while.

The scientific aspect of it was considered by the committee to be sort of a fringe benefit, a valuable one but not enough in itself.

Is that about your position, that if there were new icebreakers you would like to see them built with scientific capabilities in them?

Captain METSGER. If new icebreakers are built, sir, we would like to see the scientific capability built in them which we mentioned in our statement.

Mr. DREWRY. There are many things undoubtedly that can be done with submarines.

I would like to read just a brief statement from the committee report of last year, a quotation from Rear Adm. Charles W. Thomas, retired, Coast Guard.

The statement is [reading]:

> Exploration and economic operation of a marine economic potential requires a better knowledge of topography, geology, heat exchange, magnetism, biology, and oceanography beneath the surface of the seas. It demands a comprehensive study over many years of the physical, chemical, and morphologic and crystallographic properties of ice on the surface of the sea, and a continuance of research into phenomena relating to the atmosphere above the sea. All of these are studies which can best be carried on in areas attainable only by icebreakers.

Do you agree with that in whole or in part? Do you have any reservations about it?

Captain METSGER. I agree with that portion which has to do with the need for research and learning, sir.

I cannot contribute significant justification for the icebreaker on this basis.

I feel that the resources which the country has as matched against our great need for fully usable oceanographic research ships, these resources should go first to the standard research ship. There is so much work to be done by them.

Mr. DREWRY. Then do you apply greater priority to a standard research ship than to icebreakers that we understand are needed to escort the missions to Antarctica and the supply bases in the Arctic?

Captain METSGER. I am competent to speak only from the research point of view, sir, from which point of view the standard research ship would take the top priority.

Mr. DREWRY. But if new icebreakers were built, you would like to see scientific capability built into them?

Captain METSGER. Yes, sir.

Mr. DREWRY. That is all, Mr. Chairman.

The CHAIRMAN. Captain, were you ever on one of these expeditions to the Arctic?

Captain METSGER. No, sir; I have not been.

The CHAIRMAN. Tell me why Russia is building this atomic icebreaker.

Captain METSGER. I do not believe I can contribute any useful information to the committee, sir.

The CHAIRMAN. You said "our limited funds in this country." What other country is wealthier than this one?

Captain METSGER. I think that our country is the wealthiest of all, sir. Perhaps I should have said the resources.

The CHAIRMAN. Should we not try to keep going in scientific advancement and explore the things that we have developed?

Captain METSGER. Yes, sir. We must bend every effort to expanding our knowledge to understand what goes on in this area all over the world and to exploiting those things we learn where most useful.

The CHAIRMAN. But you want to stay in conformity with the things we have today. That is what you desire?

Captain METSGER. No; I would say we are bending every effort to push the frontiers of the oceans forward.

The CHAIRMAN. Of course, there is no doubt about our nuclear carriers.

Captain METSGER. We do not have any connection with the nuclear carriers, sir, in the Office of Naval Research, and the use of them.

The CHAIRMAN. I thought you were in the Navy. I thought you all swim or sink together.

Captain METSGER. I am an old carrier man, sir, I would like to talk about it if I were in a position to talk about it.

The CHAIRMAN. I appreciate your position, sir.

Somebody else has to do the talking.

Thank you very much.

Captain METSGER. Thank you very much, sir, for your time.

The CHAIRMAN. Dr. Jones?

STATEMENT OF DR. THOMAS F. JONES, DIRECTOR, ANTARCTIC PROGRAMS, NATIONAL SCIENCE FOUNDATION

The CHAIRMAN. All right, Doctor. Go right ahead.

Do you have a prepared statement?

Mr. JONES. I do not have a prepared statement, sir, I thought I would, with your permission, speak from a few notes and tell you about the program which we are supporting in the National Science Foundation in the Antarctic.

The CHAIRMAN. We want to stay with this subject.

Mr. Miller will attend to oceanography.

Mr. MILLER. There is a little lapover in here. We are always very happy, Mr. Chairman, to educate the full committee on this subject when we get an opportunity, so give him a little leeway.

The CHAIRMAN. All right, Doctor. Go ahead.

Mr. JONES. The area in which the National Science Foundation's program is primarily concerned covers not only the so-called Antarctic Continent but the waters about it. We consider all this as Antarctica and the regions of Antarctia because the problems in research are pretty much the same whether they are on the continent primarily, or whether they are in the seas close by.

The number of stations which we have operating in Anarctica are about seven in which the United States has connections—our regular stations at the pole, at Byrd, at McMurdo, our joint station with New Zealand at Hallett, our cooperative programs in the stations now in the custody of Argentina and Australia, that is Ellsworth and Wilkes station, and the work which we are doing together with the New Zealand people at their Scott base. We have pretty much a program which is both United States and cooperative with other nations in this area to carry out the basic research problems.

At the present time in Antarctica there are 12 nations carrying on research work who are cooperating through an international committee, the Special Committee for Antarctic Research. This Committee makes general suggestions on how we can prevent duplication of our efforts and share our results.

Mr. MILLER. Is the Soviet Union included in this group?

Mr. JONES. Yes. I probably can name them for you quickly: Argentina, Chile, Great Britain, Australia, New Zealand, South Africa, Norway, Belgium, France, the Soviet Union, Japan, and the United States.

I do not think I have forgotten one.

In addition to this, Poland is next summer going to start operating at Oasis, which is a former station operated down there by the Russians previously.

Antarctica is a very expensive place to carry on research, so that the cost per man is perhaps four times as great as elsewhere. The cost is involved with taking care of them to see that they are immediately taken care of and have plenty of food at this tremendous distance.

One of the additional problems we have is the matter of the required logistic schedule which is pressed upon us due to the difficulties of getting through the ice, and the problems which we have of reaching the continent at any time of the year. One cannot go out and get flight 13 to the pole on alternate Tuesdays. You may have to wait for 1 or 2 months when time is available. Ships can get into the continent only during the time when the ice is sufficiently soft for the breakers or ships to get through or has broken up and gone north.

Mr. MILLER. How long a period is that?

Mr. JONES. Approximately 3 months is the total shipping time that you can work in, beginning about December 1, when you can begin to get in reasonably close, until the end of February or March.

Mr. MILLER. During that period, you intensively need the use of icebreakers to get in early and stay as long as you can?

Mr. JONES. We need it to get to the continent and stay as long as we can during this period because later on the cold weather freezes the sea. It gets rather thick, up to 9, 10, even 15 feet in some areas, and this is pretty tough ice to break through by any ordinary means.

We therefore have the need to get to the continent during this period and this is our problem; otherwise, the only way in is by air. It is exceedingly expensive at present to fly everything into all the stations.

We are trying to develop in cooperation with the Task Force as many new schemes and methods for handling the logistics at a lower cost. We are trying to improve our buildings, improve our means of communication, improve the time loss because we have almost every year a layover time of 10 months for all our material which we take down there.

We can take a ship in, for example, in January or February to McMurdo, but we cannot fly the material to the pole until the flying season opens up again the following October, so we have to store our material down there for 10 months. This requires a very long range in preparing our plans and having our material brought aboard.

Any method, any scheme by which this could be shortened would make it much easier for us to plan, and I think it would be much less expensive in organizing our program.

The people who are carrying on the program are scientists from our universities and scientists from our Government agencies. This is a combined program which the National Science Foundation coordinates in our office.

We make arrangements for them to have funds through the appropriation to the Foundation for Scientific Research. We make these funds available to the agencies as they need them and to the universities for university professors and their topflight students to do work down there.

Funds are made available to the extent to which we have them appropriated for the purpose.

Now, the fields in which we are working. The program areas cover first the earth sciences.

Let me review briefly just what these cover.

Glaciology is one of our big problems, the movement of ice, the behavior of ice, the study of the characteristics of ice; geology, the character of the mountains which are coming out through the ice in spots; the study of the rock formations, their relation to rock formations elsewhere in the world.

Our hope is that perhaps if we can find similar rock formations where mineral deposits, oil, other minerals and material are, that some day we will be able to learn more about these materials and utilize them. But at the same time we are very much concerned about the lay of the rock in this area so that we will understand better what is happening to the rock deposits in other parts of the world because all are interrelated. This is part of the general background.

We have the problem of gravity; we can determine ice thickness and the shape of the ground under the ice, see it, in other words, by means of gravity and seismic determinations.

We are making studies of magnetics because this affects our communications. The effects of the magnetic field are involved with our whole communication problem.

On top of this we are doing the necessary mapping, the geodesy and cartographic work, so that we know when we study the mountains and the rocks we know where we studied them. We must have maps to do this.

In addition to these programs, we have biological and medical programs going on. We are studying the food cycles in the sea around as best we can. We are studying what few plants there are down there, essentially mosses and lichens. We are studying the life cycle of the whale, his food sources, because this is an important area where whales feed and live.

We are working on matters of viral studies in medicine. We have bacterial studies, airborne bacteria, how many are carried into the area. The spoilage of food is an interesting thing. Food very seldom spoils down there. There are no bacteria to spoil it, to speak of. You could pile up a billion tons of food if you could get it there and keep it probably for 50 or 100 years. We do not know. We have never examined the problem, but we are sure it would keep.

There are lots of economics to such a problem as this which have to be investigated.

We are studying airborne diseases. For once in our lives we can see a common cold hit a community which has had no colds; see it go through the community and disappear. This is the first time we have had an area where we can take 20 men, find them free of colds, have a new man come in and bring the cold. They all get it; and then it disappears and nobody has it again.

We are studying man's adaptation to weather. We are beginning to study how a man behaves under isolation. Where else can we find how a man would feel in space? That is about the closest thing I have even seen to really being "far out". You look around down

there and you think you are nowhere. It is really quite a sensation, psychologically.

We are studying the social psychology of people down there. You have it sort of "made" by these small groups of scientists.

In addition to this, we have the atmospheric sciences. We are studying ionospheric physics, the Heaviside layer which affects our whole communications and produces blackouts; cosmic ray work and its effects on mutation are studied.

There is no better place to study the cosmic ray movement. We are studying aurora and airglow. These are all subjects so essential to communications. The effect of sunspots on these is important. Meteorology; the whole general weather picture, the effect of southern weather on northern weather. We know there is a relation but we do not know exactly what it is yet. We intend to get to the high atmosphere to see what these relations are through a rocketry program.

We want to develop a study of astronomy down there. This is the clearest air in the world. There is no dirt in it. People at the pole can view a star over the polar mountains and photograph the thing for 5 months in a row. Nothing like that can be done here.

We want to develop some further sociology. We want to get into some engineering work. We have to consider the possibility of economic problems down there; to consider satellite tracking for a polar satellite. Here we can see it go by every time. We do not have to wait for it to make several revolutions but you can see it pass every time. We have been doing that by visual methods already.

We have a wide variety of experimental work to develop completely new things, many of which none of us have thought of to this day. We are absolutely responsive to all new ideas which may appear.

On top of these there is one other field and that is the field of oceanography. We have only a land based oceanographic program in force now. We have no oceanographic ships down there upon which we can do any work. The only oceanographic work we can do is to get in a small boat when the ice is broken up or we must do the work aboard a navy ship or a supply ship which is in the process of going down or coming back. This means that any man who gets aboard this vessel must work on a noninterference basis with the program. After all, the captain of the ship must see that the material gets there. There are men on the continent who need this material. He has to be sure he can get in and out. He cannot always afford to stop for 3 or 5 hours or a day in the middle of one of these trips for the scientists to make a series of measurements. The purposes of these ships, you see, are different. A ship that is in the middle of logistics, has a job to do. Its time its limited. It has to go some place. It has to come back. An oceanographer who wants to get aboard this program wants to sit some place for a week. The two just do not belong together in first class research perhaps as we see them today.

Now, we want to have shipboard oceanography down there because for the first time we look at this ship as another station "on" the Antarctic Continent, but just off of it, you see. We are making certain measurements at Byrd Station but we would like to make similar measurements at a hundred points. We would like to make conjugate

point measurements, measurements of the aurora and gravity. We would like to make these measurements at the exact opposite point of the earth at which we have made them in the north because some of these things are affected by the north and south pole.

We want to see that the measurements are done simultaneously at these places. We can only do this on a ship which can afford to go some place and wait until the moment comes. This means that we do need a ship of some sort as soon as such ships can be available but this does not mean necessarily that we need to be able to do this aboard a supply ship or a support ship of the Navy.

We have other stations we would like to build on a temporary basis on the Antarctic Continent.

All of this requires logistics. All of this requires service on the part of the force who take us down there and bring us home.

This outlines in a very rough fashion, sir, the scientific program which we are trying to undertake.

The CHAIRMAN. What if any advantage would an atomic icebreaker be to the studies your group are making?

Mr. JONES. I do not think I am qualified to say that an atomic icebreaker, as such, would be of any advantage to us.

You see, we have a program to put on and I will say this: that if the icebreaker to be operated by atomic power would get our program done better than any other icebreaker, then, of course, it would be an advantage to us. I am not qualified to say that an atomic one could do it better. This is the point. We do need to get there via the ships to do it.

The CHAIRMAN. How many people do you have in your expedition in the Antarctic?

Mr. JONES. Well, of the scientists about 80 this coming year. Thirty-five or thirty-six will stay over the winter and the rest are there during the summer.

The CHAIRMAN. The total number of people is how many?

Mr. JONES. The total number of people is about 400 staying down there for a long period of time, and involved all together some 2,000. They go back and forth on the ships, and so on.

The CHAIRMAN. What is the annual cost of the expedition?

Mr. JONES. My part of the program costs about $4 million. The Navy's logistic part runs about $15 million.

The CHAIRMAN. Are there any questions?

Mr. TOLLEFSON. I do not believe I have.

The CHAIRMAN. Mr. Miller.

Mr. MILLER. Would an icebreaker equipped to do scientific work, in your estimation, be desirable?

Mr. JONES. I do not think that any icebreaker ought to be built that was not equipped to do some scientific work.

Mr. MILLER. Do you think it should be designed?

Mr. JONES. I think it should be so designed. Surely, any ship of this sort going around the water should be equipped to do some scientific work.

We have to remember that there is a limited amount that it can do if it has other duties to do. I think it would be foolish to design such a ship without some scientific capability.

Mr. MILLER. And a ship that could get in and out, heavy enough, bigger than anything we now have, more powerful, that could get in earlier and stay in later would be desirable?

Mr. JONES. If we could get in earlier and stay later this would definitely be desirable.

Mr. MILLER. And you could save some money?

Mr. JONES. I think we would, yes.

The CHAIRMAN. Mr. Ray.

Mr. RAY. I have no questions.

The CHAIRMAN. Mr. Zelenko.

Mr. ZELENKO. Mr. Chairman, I left before the conclusion of the meeting yesterday and it seems to me that most everybody is well agreed that an atomic icebreaker is a necessity and would have inestimable value in many directions.

I wondered whether there was any testimony as to what all this will mean in the area of persuasiveness on the part of the administration. It has been vetoed because of the fact that we are told there is not any money for it.

Was there any testimony here yesterday as to whether our efforts will tend to persuade the President or the administration to see it our way or are we just going into this thing for purely abstract reasons?

I am for this, Mr. Chairman, but I think that is the problem before us now. We have had testimony along this line previously. Everybody is for it. It seems to be a great necessity, but I should like to hear from some witness on the part of the administration, somebody who thinks he can do something to get this matter to the President so that perhaps he can change his mind and give us what we need. Otherwise we are just going through a refresher course in something that we have already learned.

The CHAIRMAN. The Chair agrees with your observation, I do not know what we will learn in these hearings.

As I said, the hearings last year were most interesting and conclusive and the entire committee voted this bill out unanimously. The veto message did not say that the ship was undesirable. It just said there was no money so that we thought we would have, as you say, a little refresher course here. It has gone longer than I thought it would go.

Mr. ZELENKO. If the gentleman would yield, I wish we would get a refresher course in the fiscal aspects. Perhaps the money is available now.

Mr. PELLY. Will the gentleman yield?

Mr. ZELENKO. I yield.

Mr. PELLY. I was just going to say that I think in our own lives we have many things which are very desirable and are needed as the Government has many projects, and all you have to do in Government or in your personal life is to put a priority on it. It is just a question of what is needed more and was more essential.

I think maybe none of us are qualified to speak for the administration and the President.

Mr. ZELENKO. I agree with the gentleman. Obviously this is a very desirable project on the basis of the testimony. I agree with the gentleman. I would respect the judgment of the President that

there are things that have priority. If they still exist we are just taking our own time here to refresh ourselves on something that we have already learned and which will do us no good in achieving a goal at this time, which is to get an icebreaker out on the cold water.

Mr. PELLY. If the gentleman will yield further, I think we need 100 Polaris submarines but I do not know how we are going to be able to afford them all at once. I do not know how they are in comparison with an icebreaker.

Mr. ZELENKO. Again I agree with the gentleman but I think the one bit of testimony that is lacking here is from someone in the administration to repeat that there is not any money now and then I do not have to sit here and listen to the same thing although I enjoy it.

Mr. PELLY. Mr. Chairman, I think this hearing is serving a very definite purpose. It is keeping alive the project which is scientifically very desirable. It is bringing in new testimony and it is evidently refreshing us as to the justification and the advantages of a project which we certainly ourselves have to sell in our own way.

Mr. MILLER. Will the gentleman yield?

Mr. PELLY. I certainly do.

Mr. MILLER. I agree with you. I think we have come to the place where it is just a matter of salesmanship and, if we keep knocking at the door and asking them to buy, sooner or later, maybe to get rid of us, they are going to buy the program.

I think this is a very good program that deserves to be kept alive and I am for it.

The CHAIRMAN. Thank you very much.

Mr. JONES. Thank you.

The CHAIRMAN. We will now hear from Admiral Richmond.

STATEMENT OF VICE ADM. ALFRED C. RICHMOND, THE COMMANDANT, U.S. COAST GUARD

The CHAIRMAN. Admiral, do you want to bring up any of your staff?

Admiral RICHMOND. Captain Whalen.

Mr. Chairman, I want to apologize for the fact that, although I have some prepared notes here, I do not have finished copies to present to the committee. This statement I am going to make has just recently been prepared. I would like the committee to understand that it does not have the clearance of the administration nor the Department. I am speaking for myself in appearing here and for the Coast Guard, sir.

Mr. Chairman, last year in appearing before this committee in support of H.R. 9196, which was identical with H.R. 4 and its companion bill, H.R. 288, I made a detailed statement in which I traced at some length the history of the development of icebreakers in the United States. I set out in that statement the icebreakers presently available to the United States, and how the two operating agencies, namely the Navy and Coast Guard, had obtained those icebreakers. The statutory authority and mission of the Coast Guard to [reading]:

operate, with due regard to requirements of national defense * * * icebreaking facilities * * * for the promotion of safety on * * * the high seas * * * (14 U.S.C. sec. 2)—

as well as the specific mandate that—

> For the purpose of executing the duties and functions of the Coast Guard, the Commandant may (*a*) maintain * * * icebreaking facilities (14 U.S.C. 93)—

were pointed out. Notwithstanding these express provisions, I stated that I could not then state that in the discharge of its icebreaking responsibility to commerce, there was a present requirement for additional icebreakers in the Coast Guard, and that the need for additional icebreakers must rest on a broad national need either in the area of defense, scientific research, exploration of Arctic and Antarctic wastes, or a combination of all these factors.

I concluded by saying that if such a need were established on the basis of the very excellent and expert testimony presented to this committee, then it was my opinion that the Coast Guard was as well fitted both by training, tradition, and experience to operate such a vessel as any other agency. In fact, my closing paragraph emphasized this when I said, and again I quote:

> If, in the interest of the United States, an additional icebreaker is to be built, atomic or otherwise, the Coast Guard should be the agency designated to operate it.

I will state now for the committee that my opinion in connection with the operation of any icebreaker has not altered in any respect, and I feel as strongly today on that point as I did last year. With respect, however, to the need for a new icebreaker or icebreakers—and I should here like to point out to the committee that I advisedly use the word "new"—not necessarily additional—that in the year just past certain new evidence has been developed that was not available last year, and which, while not necessarily conclusive, points more decisively to a requirement for a prompt icebreaker building program, both for additional as well as replacement vessels. This appears true whether we consider this requirement as a national need or a specific Coast Guard request.

Before discussing this evidence, I think the committee should bear several things in mind. First, the bill before the committee last year, as well as these bills, all go to a specific purpose; namely, to authorize a nuclear-propelled icebreaker to be operated by the Coast Guard. Generally speaking, the testimony before the committee last year, and I have reviewed that testimony carefully, goes largely to the pros and cons of atomic power in an icebreaker, even to the point at times of reasoning that since the Soviets are building an atomic icebreaker, we should build one also. In this way it seems to me that the issue of the necessity for an icebreaker or icebreakers has been glossed over. Unless we accept the premise that an atomic icebreaker is desirable, either for experimental or propaganda purposes, I feel the question of icebreaker need, apart from propulsion problems, should be resolved first. Although as indicated, H.R. 4 is limited in concept, from the testimony heard yesterday and comments of committee members, I sensed that there was a broadening of concept to the need for icebreakers generally, and so, with the chairman's permission, I will proceed on this premise, leaving the discussion of propulsion until the end of my statement.

In addition, I would like to discuss with the committee my concept of the responsibility of the Coast Guard with respect to icebreaking.

Without belaboring the point, you will find that historically, and with both legislative and executive approbation, this is limited to icebreaking in the support of commerce or for humanitarian purposes. Generally speaking, this purpose is restricted to waters of the continental United States. Therefore, for any operations in the Arctic or Antarctic on our own or in support of the Navy, it must be predicated on some other basic authority than that for icebreaking itself. It has, I acknowledge, been argued that since MSTS charters or utilizes in some instances civilian merchant vessels, this is commerce, but I feel that this is as specious as the contention that, since the western end of the DEW line is now supported by private contractor, this is commerce which by statute the Coast Guard is bound to protect. This is not to say that the Coast Guard does not have authority for its operations in the Arctic or Antarctic, but merely to emphasize that icebreaking is not specifically one of them (14 U.S.C. 141); which authorizes cooperation with other Government agencies, is certainly sufficient to fully justify using Coast Guard icebreakers to assist the Navy in its important missions in the interest of defense of our country. Since, however, our seagoing icebreakers are operating more than 50 percent of their time in support of the mission of assisting the Navy, the statement of an additional requirement is not in the final analysis properly that of the Coast Guard alone.

Now, as distinguished from last year, the requirement for additional icebreakers is more clearly evidenced. Yesterday, Vice Admiral Gano, head of MSTS, testified that in the continuing support of arctic bases such additional icebreakers were necessary. I am sure that his testimony was predicated on the considered reports of his operational people, who in the limited arctic summer period, have the pressing job of getting the required cargo through. They have in the past had their working period foreshortened by lack of sufficient icebreakers in the total, or failure of available icebreakers through unanticipated mishaps. I suspect that to some extent their views have been occasioned by occurrences such as the following:

As a result of the severe ice conditions this year in the vicinity of Harmon Air Force Base in Newfoundland, CNO made an urgent request to the Coast Guard for icebreaker assistance that had not been scheduled. Neither of the Coast Guard's east coast icebreakers was in a standby status at the time, both being in an availability status after completing normal winter icebreaking in support of local commerce as well as in preparation for the forthcoming summer arctic cruise. However, plans were made to sail the *Eastwind* as early as possible. Orders to proceed were given the *Eastwind* on a Friday afternoon. After a weekend spent in receiving commissary stores and making all other preparations, the *Eastwind* departed Boston on Monday morning, February 9, and commenced ice operations 2 days later. The total period of this extended emergency cruise was 45 days.

After the *Eastwind* departed, a request for an additional icebreaker was received on February 19. This request having been anticipated to some extent, the *Westwind* was sailed the following day to join the *Eastwind*, and this cruise lasted 56 days. These two unanticipated cruises, representing 3 ship-months, were accomplished at considerable interference to the normal preparation for the summer cruise to the Arctic, and do, in my opinion, give substantial credence to the claim

of MSTS that in icebreaker support the United States is operating on a margin that is either insufficient or too close for safety. The committee will recall that last year I told you that several years ago, the Coast Guard icebreaker *Eastwind* had the distinction, a dubious one perhaps, of having operated for extended periods both above the Arctic Circle and below the Antarctic Circle in the same year. While this comment was made lightly at the time, I am quite serious when I tell you that you are pushing both your facility and, what is more, your personnel, to the limit, when scarcity of vessels compels you to go to such extremes.

Another item of evidence of the need for additional icebreakers is the opening of the St. Lawrence Seaway. I referred to this in my statement last year, and yesterday Vice Admiral Gano commented on it also. Last year the problem was somewhat academic because the seaway was yet to be opened. Today it is more acute because the seaway is open. We know that last fall, before the opening of the seaway, a number of small oceangoing vessels were almost trapped in the lakes for the winter by ice. Now with the lakes open to larger vessels, each trying to stretch the operating season to gain the maximum economic advantages of the Great Lakes trade, it appears that icebreaking facilities will be in more demand than ever, and this will be a direct Coast Guard responsibility. It would be naive to assume that all that is necessary to keep the St. Lawrence Seaway open is icebreaking facilities, but it would be equally naive to assume that you are even going to make a start in keeping it open without icebreaking facilities.

There is one other facet of evidence which, while not pointing to the need for additional icebreakers, points the way, as I indicated earlier, to the need to start an icebreaker building program now. All of the existing icebreakers, with the exception of the *Glacier*, are of wartime vintage, which gives them presently an age of approximately 15 years. During this period these vessels have all seen arduous, and in some periods almost continuous, service under adverse conditions. It is true that the vessels were designed to meet these conditions, but it appears to me that age is beginning to take its toll, and we must realistically accept the fact that the icebreakers should and must be replaced in the not too distant future of 5 to 10 years. We know that we in the Coast Guard have subjected our icebreakers to rugged service, and we suspect that the Soviets, during their period of control, operated these vessels to full capacity.

It may be purely coincidental, but it will be recalled that in 1955, the *Eastwind*, while operating in a lead, suffered a major hull fracture as a result of what appeared to be a relatively minor contact with the ice. Today, I have several dispatches recently received from the *Eastwind*, indicating cracked plating and frame damage, necessitating the placing of a soft patch over the area to get the vessel back to Thule, where it is hoped temporary repairs can be effected.

What is alarming is that the *Westwind*, operating separately, reports 2 days later damage in the same general hull area as that of the *Eastwind*, though not to the same extent.

It is my opinion that these failures are increasing evidence that time is running out for the icebreakers, and unless a program of replacement is inaugurated, we may shortly arrive at a situation where

operations may be seriously curtailed by failures that will necessitate the withdrawal of the vessels for lengthy and expensive overhauls.

From what I have said, I think I have made it clear that it is my personal opinion that the need has been demonstrated for an orderly replacement program for icebreakers, and also for additional icebreakers. As to the propulsion plant that should be incorporated in any new construction, whether additional or replacement, the committee has already heard much expert testimony both for and against. Admittedly, the incorporation of atomic power rather than conventional power is going to materially increase the cost of the unit, without a clear showing that the advantages gained from nuclear power are sufficient to justify the additional cost if the icebreaker is used for the general duty of our present icebreakers.

Yesterday, however, the committee heard Mr. William Francis Gibbs make a most plausible and persuasive argument for an icebreaker conceived and built to meet any requirement that could be reasonably foreseen rather than one limited in capability to the duties we are presently carrying out with these vessels.

From the standpoint of the Coast Guard, I can only add that we would welcome the opportunity of operating an atomic-powered icebreaker, not only because we feel such a vessel would be a superior vessel, capable of discharging any conceivable icebreaker duty, but because it would enable us to more adequately discharge two functions assigned us by statute. One of these functions is to—

> maintain a state of readiness to function as a specialized service in the Navy in time of war (14 U.S.C. 2).

If the Navy continues to progress in the field of nuclear propulsion, as I am sure they will, it is incumbent on the personnel of the Coast Guard to be ready to take their place in the Navy in time of emergency, with a practical operating knowledge of this new source of power. Thus, from a readiness and training standpoint, the Coast Guard needs practical experience in nuclear operation, and H.R. 4 offers such a possibility.

Further, if the U.S. merchant marine continues to advance in the field of nuclear propulsion, and under the leadership of this committee I am sure they will, the experience gained in the operation of an atomic plant would be an invaluable aid to Coast Guard personnel in more properly discharging our statutory function of the inspection of such nuclear-powered merchant vessels, as well as the certificating of the personnel for their operation.

These points I admit, present, of course, only incidental advantages to the question of the desirability of an atomic icebreaker, but to the Coast Guard they are very real.

Finally, I would like to point out that H.R. 4 and the related bill, present one advantage that has not been greatly stressed. It has been said properly that it is only an authorization bill. Without withdrawing anything I have said about the present needs, and on the premise that we merely accept the possibility that such an icebreaker as H.R. 4 conceives might, in an emergency, be a requisite, then there is in the interest of saving time in such an emergency the merit of having this authority on the books.

The history of the *Wind* ships points this up. They became a necessity during World War II. Yet it was necessary to come to Congress to get the necessary authority to build them. True, Congress acted very rapidly, and in times of stress legislative processes are unquestionably foreshortened, but any time used in obtaining authority is that much time lost toward achieving the objective of the operating icebreaker.

I believe that H.R. 4 covers an authority which should be extant and, if it is impractical to implement it during normal times, at least the authority is available to be immediately implemented when an emergency exists.

In closing, I can only paraphrase my closing paragraph of last year's statement in light of the new information that I have referred to by repeating that I believe that a need for an additional icebreaker or icebreakers has been shown, I think the authority for their construction should be granted, and if built the Coast Guard should be the agency to build and operate such vessel or vessels.

I would be very happy to answer any questions.

The CHAIRMAN. Admiral Richmond, I feel like we have accomplished something here in this committee, and I am delighted to hear you make the statement that you have just made.

Would you suggest that this bill be amended not only to authorize the construction of a nuclear icebreaker but two additional icebreakers of the conventional class?

Admiral RICHMOND. I would suggest that the bill be amended, and not limited as to whether it would be two icebreakers, "to meet the needs of the United States" would be better.

The CHAIRMAN. Icebreakers to meet the needs of the growing commerce of the United States.

Admiral RICHMOND. Yes, sir.

The CHAIRMAN. Mr. Ray.

Mr. RAY. I have no questions.

The CHAIRMAN. Mr. Miller.

Mr. MILLER. I am very happy to hear your statement, Admiral. It gives more weight to the thing that I just said, that if we keep selling it long enough we will make a sale.

I have no further questions.

The CHAIRMAN. Mr. Mailliard.

Mr. MAILLIARD. Yes, Mr. Chairman.

Admiral, under the language in the bill, would it be practical for the Coast Guard to request funds for planning and getting things in shape to build such a vessel even though it might be known that the funds for construction would not be available?

Admiral RICHMOND. Certainly that would be the first step, anyway, and I think it would be practical. I think that if the bill were amended, as the chairman has suggested, to encompass more than just the building of an atomic icebreaker, and I am only expressing my opinion here, it would give more weight to the Coast Guard if the bill itself indicated that forward planning should be made toward an atomic icebreaker.

Mr. MAILLIARD. That was the point I was trying to get at. It would seem to me that we might draft a bill which clearly showed that it was the wish of Congress that, even though on a priority basis this

might not be the moment to start construction of a nuclear-powered icebreaker, we should go ahead immediately with planning in this field so that when the need became acute or the funds became available we could move quickly.

Admiral RICHMOND. I think it would be very valuable because, for example, even that would help everybody, not only the Coast Guard to really come face to face with this cost element. Truthfully, as you know, last year and even this year, the costs of such an icebreaker have been bandied around and very honestly they vary from, I think last year, possibly $60 million, based on a *Glacier* with a reactor, up to figures I have heard of the ideal of $200 million.

Until you go ahead and actually have the money to plan, not talking about building but planning, I do not think anybody is ever going to be able to know whether you are talking about $60 million or $200 million, sir.

Mr. MAILLIARD. Certainly the vessel Mr. Gibbs was describing would not be built for $60 million.

Admiral RICHMOND. It will not, sir. I doubt if it would be built for $100 million.

Mr. MAILLIARD. As I recall, he was talking about 26,000 tons. That is a very good-sized ship.

Admiral RICHMOND. That is a very large vessel.

Mr. MAILLIARD. What is the *Glacier* class?

Admiral RICHMOND. I cannot answer you in specific tonnage. There is only one of the *Glacier*, as you know. It is larger than the *Wind* ships.

Captain HAMLIN (H. S. Hamlin, Office of Chief of Naval Operations). The *Winds* are 7,000 fully loaded, the *Glacier* is about 8,600.

Mr. MAILLIARD. We are sort of comparing a Liberty ship with the *United States* in this ratio.

I am very much interested in that aspect of it and I would hope that perhaps we could convince the President to sign a bill at least to proceed with the planning because it seems to me that that might be quite a lengthy process.

This is getting into a field where I would assume that we would have a lot of experience since we built the *Wind* class ships.

Admiral RICHMOND. You say we have had a lot of experience in the United States.

Mr. MAILLIARD. We have had a lot of experience in operating those ships which I would think would lead to quite a few possibilities of engineering development in the planning stage.

Admiral RICHMOND. That is correct.

Mr. RAY. Will you yield?

Mr. MAILLIARD. I yield.

Mr. RAY. Could you give us an idea of the cost of the plan—how long a period?

Admiral RICHMOND. I would want to talk to my technical people. I could put it in the record.

Mr. RAY. I would like to know not only the total cost, but how it would be spread over a period of time.

Admiral RICHMOND. I will supply that information, with the chairman's permission.

The CHAIRMAN. We would like that.

(The information referred to follows:)

A feasibility and development study of a nuclear-powered icebreaker will consist of three phases:

Description	*Time (months)*
(*a*) Study of operational requirements for type and size of vessel to fit service needs	6
(*b*) Nuclear power study (coordinated with Navy, Atomic Energy Commission, commercial concerns, etc.)	[1]6
(*c*) Development of hull characteristics, model fabrication and model testing	12
(*d*) Preliminary plans and specifications	6

[1] Concurrent with (*a*).

NOTE.—Total time for required preliminary planning prior to letting of a construction contract is 24 months after funds become available. A cost estimate for the above preliminary planning is $500,000.

Mr. DOWNING. How long does it take to build an icebreaker of the *Wind* class?

Admiral RICHMOND. Of course, they were built under wartime conditions. Approximately 7 months were required from keel laying to launching and an additional 8 months for the outfitting period to commissioning, a total of about 15 months.

Mr. DOWNING. Would there be any differences in time under peacetime conditions?

Admiral RICHMOND. I would say that if you had to go ahead, unless you were working under wartime emergency conditions, it probably would be slower because you probably would not work the shifts that you would work under emergency conditions, so that I would say probably a minimum of 2 years, at least, would be required to build any icebreaker after contract is let.

The *Glacier*, which was built under peacetime conditions, it is my recollection, took approximately 2 years. Of course, I am testifying to something that concerns the Navy now.

Mr. DOWNING. How long, in your opinion, would it take to plan and construct a nuclear icebreaker?

Admiral RICHMOND. Of course, again we are talking about presumably a larger ship if you are thinking of anything like the one depicted here. I would say a minimum of 2 years to plan and 2 years to construct.

Mr. DOWNING. Thank you very much.

Mr. MAILLIARD. Will the gentlemen yield?

To get the record clear, that would be from the keel laying?

Admiral RICHMOND. Planning has nothing to do with that.

Mr. DOWNING. I meant the planning, too.

In other words, if we authorize it now and an appropriation was made, when would we have the ship?

Admiral RICHMOND. I would say you would be approaching 4 years. You are talking from the time the authorization bill or the money is available for the planning?

Mr. DOWNING. From the time the money is appropriated until the ship is built.

Admiral RICHMOND. I would say from the time the money is appropriated to the time your ship went into commission you ought to allow at least 4 years.

Mr. DOWNING. You said something that disturbed me a little.

You said both of the *Wind* class vessels are developing major defects in the same place.

Admiral RICHMOND. May I say that I cannot analyze this. It is just alarming to me that within 2 days we get reports from the two vessels operating in the Arctic that they have cracked plates and damage, sir.

Mr. DOWNING. Those ships must be subjected to tremendous strains and pressures to which the ordinary ship is not subjected.

I should think their life would be shortened thereby.

Admiral RICHMOND. Well, I think that by judicious repairs the Coast Guard is going to have the *Wind* ships around for a long time, sir. It is a fact that hull damage does seem to be coming up more frequently than previously. I am not talking about such things as propeller on which you always stand a chance, but this is the second time for the *Eastwind* in a period of 4 years.

Mr. DOWNING. What is the cost of those repairs?

Admiral RICHMOND. I would have to verify this.

My recollection is that last time it was somewhere in the neighborhood of $200,000 to repair the damage and it is going to be considerable this time because there are a number of frames.

Mr. DOWNING. Thank you, Mr. Chairman.

The CHAIRMAN. Are there any other questions?

Mr. TOLLEFSON. Mr. Chairman.

The CHAIRMAN. Mr. Tollefson.

Mr. TOLLEFSON. Admiral Richmond, I am sorry that I had to leave while you were making your statement but I told the chairman that I shall certainly read your testimony when it is printed. I am very sorry that I missed hearing it.

Admiral RICHMOND. Mr. Chairman, this was one thing. Yesterday I said that the *Mackinaw* went into commission in 1946. I would like to correct that. It was 1944. The *Mackinaw* is a contemporary of the *Wind* ships. As a matter of fact, the authority for the *Mackinaw* was practically coincidental with that of the *Wind* ships.

The CHAIRMAN. Thank you very much, Admiral.

It is necessary that you leave before this hearing is over?

Admiral RICHMOND. No, sir.

The CHAIRMAN. We plan to hear Mr. Faylor. Then we want to hear Mr. McCone. Then we would like to have you for a little executive conference.

I would like to finish that today if it is convenient to you. Is that satisfactory to you?

Admiral RICHMOND. Yes, sir.

The CHAIRMAN. I would say to the gentlemen from the Navy that, of course, we would like to have you here. I do not think it will be necessary for you gentlemen to be called to testify any further.

We would like to have you remain because I think you are going to get enlightenment.

Captain HAMLIN. Thank you, sir. We would like very much to remain.

The CHAIRMAN. We would like to hear Mr. Robert Faylor of the Arctic Institute of North America.

STATEMENT OF ROBERT FAYLOR, DIRECTOR, ARCTIC INSTITUTE OF NORTH AMERICA

Mr. FAYLOR. Mr. Chairman and gentlemen, my name is Robert C. Faylor, director of the Arctic Institute of North America.

Admiral Colbert, whom I succeeded in this position in Washington, sends his regards. He was unable to be here today.

The CHAIRMAN. That is the former Director of the Coast and Geodetic Survey.

Mr. FAYLOR. Yes, sir.

The CHAIRMAN. Indeed he is a fine gentleman.

Mr. FAYLOR. The Arctic Institute of North America recognizes the important role which could be played by an atomic-powered icebreaker, with its increased capacity and endurance, in extending our scientific knowledge of polar regions.

Although there are many compelling reasons from military, operational, and logistical points of view for the construction of such a vessel, remarks in this statement will be confined to its advantages to the advancement of science.

The Arctic Institute of North America is a nonprofit scientific organization founded in 1945 for the purpose of furthering fundamental research and coordinating scientific information of the arctic and subarctic regions. Since that time its sphere of activity has been extended to include the Antarctic, particularly in connection with the International Geophysical Year. To date, nearly 300 field research projects have been supported by the institute in all the major scientific provinces, that is, geography, geology, geophysics, engineering, meteorology, oceanography, botany, zoology, physiology, medicine, and economics. The institute also serves in an advisory capacity to the U.S. Office of Naval Research and the U.S. Air Force Geophysics Directorate. The institute's governing body is composed of representatives from the scientific community, Government, and industry.

In recent years our national interest in polar regions has greatly increased. With this interest our lack of fundamental knowledge of these regions has become very apparent. In order to operate effectively, to develop their resources, and extend our transportation routes, we must understand the nature of the environment. This can be done only through long term, continued basic research.

In the marine sciences, our knowledge is poorly developed because of great areas of polar seas which are covered by restrictive pack ice. Aircraft have been able to establish scientific stations on ice islands, and more recently the atomic submarine has penetrated the inner regions of the Arctic. However, all possible means must be employed to help complete the true picture. An atomic-powered icebreaker would be a most important tool in expanding our scientific knowledge of ice-covered seas, because it would have increased capacity for carrying scientific equipment, laboratories, and personnel, and would have greater operational capability. It could operate for extended periods with safety where conventional icebreakers cannot.

An icebreaking research vessel could provide important and expanded basic knowledge in such specific and related fields as:

1. Bathymetry and marine geology (form and nature of the ocean floor, Continental Shelf, and channels);
2. Physical oceanography (currents, water masses, exchange and renewal processes);
3. Sea ice studies (distribution and character in relation to geographic and oceanographic conditions);
4. Geodesy (charting of the Antarctic coast);
5. Meteorology of both polar regions; and
6. Marine biology (factors determining productivity of polar waters).

It is recommended that an atomic icebreaker be authorized and it be provided with adequate scientific laboratories and equipment for making scientific observations. Ample accommodations should also be provided for scientists. We believe that such a vessel, so fitted, would bring tangible advantage to the scientific community, play a significant role in increasing our knowledge and understanding of the polar regions, and thus contribute to our overall national interest.

I would be very happy to answer questions.

Mr. MILLER (presiding). Thank you very much, Mr. Faylor.

You have heard some of the discussions here, I trust, over the past couple of days. Have you been here?

Mr. FAYLOR. Yes, Mr. Miller, I have.

Mr. MILLER. Here is the chairman now.

The CHAIRMAN (presiding). That is all right.

Mr. MILLER. Of course, we are confronted with the problem that, in authorizing this icebreaker primarily to carry out the authority of the Coast Guard in the matter of protecting commerce, the scientific features would apparently be incidental, but do you think that in order to get the basic knowledge in the field that you outline that it would be necessary to have this icebreaker specially assigned to that field from time to time?

Mr. FAYLOR. Yes, sir. I believe that would be a very desirable situation. Also, I would like to add comments pertaining to your question that the basic science which I referred to is fundamental to the increase in commerce in polar waters. Therefore, use of the icebreaker for this purpose would be a long-range contribution to commerce which is, of course, the prime aspect of this committee.

Mr. MILLER. Of course, you would have no trouble selling me on that. I only wish we could convince some of our other people of that.

Mr. Chairman, I have no further questions.

The CHAIRMAN. Thank you very much, sir.

If there is anything else you desire to put in the record, we will be glad to give you that opportunity.

Mr. FAYLOR. Thank you.

The CHAIRMAN. We will now hear Mr. McCone of the Atomic Energy Commission.

STATEMENT OF JOHN A. McCONE, CHAIRMAN, ATOMIC ENERGY COMMISSION

The CHAIRMAN. Mr. McCone, for your information, before you proceed, we have had a strong recommendation from the Coast Guard that this bill be amended. It has been shown that we must build new icebreakers. The icebreakers we have are deteriorating at such a rapid pace that there must be some program for replacement. In the bill that we have it has been recommended that we prepare a study period and provide funds for the planning and programing of a nuclear icebreaker as well as conventional icebreakers so that I just thought I would give you the advantage of that before you began your testimony.

Mr. McCONE. Thank you very much, Mr. Chairman.

The CHAIRMAN. We are delighted to have you here with us today. This committee has high regard and respect for you.

Mr. McCONE. Thank you. I assure you it is always a pleasure to have an opportunity to appear before this committee.

I have just a brief statement.

I would like to state at the outset that the Commission is not in a position to make a determination on the requirements for an icebreaker. The justifications of its use and cost are not within the purview but are the responsibilities of other agencies.

I would like to point out, however, that, if such a vessel is needed, I would think it would be not only feasible but advantageous as well to use a nuclear plant as a source of power. The requirement of an icebreaker to spend prolonged periods of time at sea at high power output without opportunity for refueling could be more than adequately met by the use of nuclear fuel.

Further, the use of nuclear fuel would permit an extended range and might permit substantial weight and space savings to be made.

Also, the proposed vessel could provide electrical and steampower for other purposes including servicing remote stations for extended periods.

In addition, this capability could provide standby power for domestic needs in the event of a national emergency.

Finally, if such time were allowed for research and development the construction and operation of the reactor might contribute materially to the advancement of reactor technology.

All of these remarks were incorporated in my letter to you, Mr. Chairman, last April when we commented on the bill, H.R. 4. The only point I have to add to that statement which really was contained in the letter was the fact that recently, as you know, Admiral Rickover accompanied Vice President Nixon to Russia and had an opportunity, after some little difficulty, to make a rather thorough investigation and on-site survey of the *Lenin*, the new Russian icebreaker and it might be of interest to this committee at some time to talk with him about his views on that particular ship.

I am prepared to answer any questions in connection with this project or any other matters, Mr. Chairman.

The CHAIRMAN. May I ask if you have had a conference or discussion with Admiral Rickover as to his observations of the Russian atomic icebreaker?

Mr. MCCONE. Yes, sir, I have had several talks with him. It was at my suggestion that he accompanied the Vice President, and I have been very interested in his observations.

He found that the *Lenin* was substantially completed, although it had not been brought up to criticality. The fact is there had been no attempt made as yet that he could determine to start the nuclear reaction in the reactors. He felt that the quality of construction was generally good. He was in no way critical of the design of the reactors as he was able to observe them.

I think that he felt that the fundamentals of his own design were preferable to that followed by the Soviets inasmuch as he confines in his designs to a pressure of about 1,800 pounds where this, he was told, would operate at 3,000 pounds. This complicates the problem of leakage and of circulation of water and of pumping and various things.

He observed that the ship had three reactors of which any two would be required to propel the ship so that that gave them one standby reactor. However, all three reactors were located in one compartment which in turn was insulated properly for radiation effects. This made it impossible to work on one of the reactors while the other two were in operation so that if the purpose of having a spare reactor was to provide an extra facility in the event of a shutdown you could not make a repair while the ship was in operation.

He contrasted that with the design of our ships in which we have more than one reactor and we put them in separate compartments which are insulated one from the other so that if one reactor is down and in need of repairs, it can be shut down and men can go into the compartment and make the repair if that is necessary.

He went and observed construction work on two central power stations. He was surprised that the work had not advanced quite as far as we thought from reports that we had received at the Geneva Conference in 1955 and 1958. One was a boiling water reactor in which there were two units instead of four as originally planned, the units to produce about 100,000 kilowatts electrical from each unit so that the plant, when completed, and it will take 2 or 3 years in its present state of construction, will produce 200,000 kilowatts.

We have a plant of this type which will go into operation next month.

He also visited the construction of a pressurized boiling water plant of the same type as the Shippingport plant. That, too, was in the process of construction and some considerable time will be required to complete it. That plant was made up of 200 units and, as I recall, they would produce about 100,000 kilowatts electrical in each unit.

That, as I recall his statement, would require 2 years or so to complete from his estimate of the status of their construction work. He thought that we compared rather favorably because our Shippingport plant has been in operation, as you know, for 2 years. Shippingport was designed for 100,000 kilowatts electrical although to date it has only operated at 60,000. However, we find that by a new core we can increase that unit to 150,000 kilowatts electrical and the authorization

and appropriation measures which you have passed have given us the authority and funds to go ahead with that increase in size assuming that we can make appropriate arrangements with the Duquesne Power Co. to operate the plant.

In general, he was impressed with their technology and the quality of the men that he talked with, and I think he had a very frank and useful exchange.

With respect to *Lenin*, it might be quite interesting for this committee at some time convenient to you to have him tell you in detail of his observations, and I am sure that he would be very happy to come up.

The CHAIRMAN. Thank you.

Did you gather from the conference you had with Admiral Rickover that he was impressed enthusiastically to the extent that he felt that we should begin to plan and program a similar ship in this Nation?

Mr. MCCONE. He did not make that statement to me; no.

The CHAIRMAN. I understand that, but from your conversation, did you get that impression?

Mr. MCCONE. No. He did not. He felt that from all he saw we were so far ahead in the nuclear propulsion of ships with our great number of submarines and with the crews that are now in the water and coming along rapidly; and, with the aircraft carrier under construction and the destroyer under construction, he seemed to feel that we had quite a substantial load.

The CHAIRMAN. The testimony here has been that it would be approximately 3 years or 4 years before such a ship as we contemplate could be brought into being.

Would you recommend to this committee that we provide here for a period of planning and programing for the construction of such a ship?

Mr. MCCONE. Well, as I say, Mr. Chairman, I have not made a study of our needs for icebreakers or the status of our icebreaker fleet.

The CHAIRMAN. The status is bad today.

Mr. MCCONE. On the assumption that the status is bad.

The CHAIRMAN. It is bad. That is the testimony here.

Mr. MCCONE. I think it might be a good idea to do what we are doing on the big tanker. That is to take a few months and make a very careful study and that study on the tanker is now underway. That might be a very good idea with the icebreaker. There is bound to be a question arise as to whether this should or should not be nuclear and such a study would develop the advantages of the nuclear icebreaker over the conventional and the costs and then, the using agency, and I presume that is the Coast Guard, could make up its mind using all the facts.

The CHAIRMAN. We take it that you are enthusiastically interested in the advancement of nuclear energy and propulsion for all types of ships and that you will keep abreast of this new source of energy and the utilization of it both for peace and war?

Mr. MCCONE. That is correct.

The CHAIRMAN. This offers a great opportunity.

Mr. MCCONE. I would think that. I would think that a study of this would be a very good thing to do. I think if such a study is made we should make the study in the light of how we would get an

icebreaker, assuming one is needed, for the least cost and in the shortest time and to have the most dependable possible ship.

There is a tendency at times to say that, because you are going to build something new, it has to be exotic and different and radical in its design and that might cause unnecessary expense and consume a great deal more time.

The CHAIRMAN. I did not mean to pass over your calling to the attention of this committee your study with respect to the tanker. This committee is greatly interested in that also but we have this matter of icebreakers before us at the present time.

Mr. MCCONE. I appreciate that, sir.

The CHAIRMAN. I want to assure you that this committee is interested in the nuclear tanker.

Mr. MCCONE. And that study is going forward between the Maritime Administration and the Atomic Energy Commission as you know and we will have some very solid information to discuss with this committee and with the Joint Committee early next year.

The CHAIRMAN. And there is one other observation on which I would like to comment.

Since the Coast Guard in its peacetime status is under the Treasury and then in the case of an emergency goes under the Navy, in your opinion, with the Navy progression so rapidly in nuclear propulsion, should the Coast Guard keep abreast of nuclear propulsion by practical operation so as to bring its experience when it becomes part of the Navy when the emergency arises?

Mr. MCCONE. Well, on the assumption that the Coast Guard, after an analysis of the studies that are proposed, would decide that it would be in their interest to have nuclear propelled icebreakers, then, of course, they should take steps to develop the techniques and training and do as the Navy has done. On the other hand, they must have the facts to reach that decision.

The CHAIRMAN. In the general operation of ships which we are now in, the combination cargo-passenger *Savannah*, which we are all proud of, the Coast Guard has a close relation to the operation of commercial ships in that instance and in the tanker instance.

Mr. MCCONE. Yes, sir, because they have very definite responsbilities.

The CHAIRMAN. So that you must say that the Coast Guard must keep abreast and have practical opportunity in the operation of nuclear propelled vessels. Would that be your feeling?

Mr. MCCONE. Yes, I think that is right.

The CHAIRMAN. You would agree that they should go into this field?

Mr. MCCONE. No; I would not feel that they should go in merely for the purpose of gaining some practical experience unless it is demonstrated that their particular mission requires that they have nuclear ships. I think they can get the necessary experience to discharge their responsibilities in connection with safety of entry to harbors and all the other matters that come under their jurisdiction without going to the very substantial and great expense of building an icebreaker.

The CHAIRMAN. Of course, in the icebreaker that we contemplate with nuclear power, it would be equipped for scientific purposes and

expeditions to the Arctic and Antarctic and that lends weight to the necessity of a ship.

Mr. McCone. Yes; that is correct.

The Chairman. The testimony here on that field has been most interesting, Mr. McCone.

Mr. McCone. Yes; and its almost unlimited range because of the fuel situation makes it very desirable for expeditions of that type.

The Chairman. That must be taken into consideration when we think about the cost as between the atomic icebreaker and the conventional icebreaker.

Mr. McCone. Yes. It is very difficult to reduce the desirability of a ship such as an icebreaker or a naval vessel on the basis of the economics of either original cost or operating cost, because there are certain imponderables or intangibles that are of great value but they cannot be measured very well in dollars and cents.

The submarine, for instance, is more costly to fuel at the present time than a conventional submarine, but it is an entirely different weapon than a conventional submarine because it can go out and stay submerged for an indefinite time and this makes an entirely different weapon out of it.

The Chairman. Mr. Tollefson.

Mr. Tollefson. I do not have any particular questions but the thought has occurred to me as we have considered this icebreaker thing that perhaps many people believe that an icebreaker can be used for nothing else except breaking ice to make a path for another ship. An icebreaker very well could be used for research work and go to places where another research vessel could not ever go. In other words, it would have to break ice to get there all right but it would not be breaking the path for another vessel. It would be enabled to go where it wanted to go for research and scientific purposes where another vessel could not go.

Mr. McCone. I think there is a lack of appreciation of the versatility of an icebreaker and the wide variety of uses to which it could be put, the scientific ones being of great importance. There is a tendency to think of an icebreaker as just something that will plow the ice out of the way and open up a channel here and there, and that is not its only purpose by any manner of means.

Mr. Tollefson. The plan that we had before us the other day indicated that this particular icebreaker would carry about 2,000 tons of cargo in addition to its own supplies and equipment so that it could very well be used, for instance, to carry supplies to Antarctic bases which present icebreakers could not do.

If we had to furnish supplies to a base in the Antarctic we would have to send an icebreaker down there to break a path for a supply vessel. The icebreaker could serve a dual purpose, it seems to me.

I have no further questions, Mr. Chairman.

The Chairman. Mr. Miller.

Mr. Miller. I am very much interested in the scientific phase of this, Mr. McCone. I feel that there are certain facets of the earth sciences that we have not scratched yet particularly in the field of oceanography that have great importance to us. We cannot put our finger on them right today any more than 20 years ago, people working in the atomic field, which is so important today, could look

forward to today and see that we were going to have a submarine powered by atomic energy.

Mr. McCone. That is correct.

Mr. Miller. Yet this money they spent is now paying off. I think this is the most important field where such a vessel could be used. We would still have it for the practical purposes of paving the way for other ships and in case of a war emergency it could be used in many fields.

Mr. McCone. I think there is a report which one of the scientific groups, whether it was the National Academy or the National Science Foundation, made here recently indicating and recommending that we pay more attention to this science of oceanography. Perhaps you saw that report, Mr. Miller.

Mr. Miller. I am chairman of the subcommittee that is looking

The Chairman. Mr. Miller is chairman of that subcommittee.

into that report. It was rendered by the National Academy of Sciences and it is a most interesting report trying to point up the fact that we know very little about that which is below the surface of the ocean and with the submarine that can go down and stay down indefinitely it is rather essential that we know the properties of the ocean floor, its currents, its chemistry, if we are going to put this weapon to its maximum advantage.

Mr. McCone. I think that is correct.

Mr. Miller. So that we have developed the weapon from a military standpoint before we have fully developed the potentiality of using it to its fullest degree. This is what the Academy of Sciences is pointing up and I think this is the place where the money we put into the atomic icebreaker would be more than justified along with, as ancillary things, giving the Coast Guard the opportunity of familiarizing itself with this type of ship so that in the event it has to take over with the Navy it is not coming in cold, and certainly with the knowledge that they gain I do not think there is any question that in the future, maybe not within my lifetime but certainly within the lifetime of many sitting in this room, atomic ships are going to be much more common than they are today.

I believe in one report on the matter of disposal of atomic waste, the Academy of Sciences assumed that by 1970 you would have 300 atomic vessels throughout the world. Here it is a case where, in their inspection, full knowledge of how they operate is going to be necessary. This may come to the Atomic Energy Commission. It is going to be no different than steam vessels are tomorrow or the running of an electrical powerhouse.

The first ones had to be run by highly skilled people but this becomes a trade that you turn on and it is only going to be gained through the practice in that trade; is that right?

Mr. McCone. Yes, I think that is right.

The Chairman. Mr. Mailliard.

Mr. Mailliard. Mr. Chairman.

First, may I say we are happy to have a distinguished Californian here.

Mr. Miller. May I join you in that as a fellow Californian.

Mr. Mailliard. Mr. McCone, in this research and development, could you give us any even rough idea first as to the time that ought

to be spent in development before you start thinking too seriously about construction?

Mr. McCONE. You mean in the study of an icebreaker?

Mr. MAILLIARD. Yes.

Mr. McCONE. I would think from a standpoint of the nuclear end of it that it would be a matter of months. I do not know how long it would take the Coast Guard or the Navy on the study of the ship itself. I would think that in a matter of 9 months or so, we could do a very comprehensive study on the nuclear power end of it.

The reason for that is that we have fully developed now a family of reactors of various sizes which are very efficient and having produced quite a number of them the initial costs have come down. We are making enormous progress in the life of the fuel elements and consequently the cost of their operation. Therefore, it would not be a very particularly difficult problem.

Mr. MAILLIARD. Offhand, you do not see any special problems in connection with a powerplant for an icebreaker that would not fit into the problems that you have studied in connection with other types?

Mr. McCONE. That is correct.

Mr. MAILLIARD. If we were to draw up a bill that specifically authorized this research and development and subsequently construction, to whom normally should the funds be appropriated for the research and development? In this case would they be appropriated to the Treasury Department which would then contract in someway with you, or would they be appropriated to the Atomic Energy Commission? How is this done?

Mr. McCONE. I think that the best way to do it would be to appropriate to the Treasury Department who would have the primary responsibility and then they could turn to the Atomic Energy Commission and perhaps turn to the Bureau of Ships, too. I do not know how the Coast Guard handles their design and ship development program.

It would seem to me that that would be a reasonable way to do it.

Mr. MAILLIARD. In this instance, I think it is quite clear that Treasury, Navy and the Commission would have to set up some kind of joint venture in the planning because this vessel should meet Navy requirements for mobilization purposes as well as Coast Guard requirements.

Mr. McCONE. Yes; it must do that.

Now, the *Savannah* was handled a little differently, as you remember. I think that there there was an authorization and an appropriation made directly to Maritime and another one made to the Atomic Energy Commission.

That worked out satisfactorily, but the alternative of making a single authorization to the responsible using agency and then having them turn to the Atomic Energy Commission to develop the atomic plant is a perfectly satisfactory procedure.

Mr. MAILLIARD. As I recall the *Savannah* bill, we specifically authorized in it such interagency cooperation as might be required but I guess it was in the discretion of the Appropriations Committee as to how they appropriated the funds.

Mr. McCONE. I was not here but apparently it was handled in two appropriations. It worked out very well.

The CHAIRMAN. The authorization was to both.

Mr. MAILLIARD. The authorization was to both. I notice that the same thing is true in this bill as drawn, "authorized to be appropriated to the Treasury Department, U.S. Coast Guard, and the Atomic Energy Commission."

That is all I have.

The CHAIRMAN. Mr. Downing.

Mr. DOWNING. I have no questions, Mr. Chairman.

I enjoyed the presentation.

The CHAIRMAN. Thank you very much, Mr. McCone. We appreciate your coming over.

Mr. MCCONE. Thank you very much.

The CHAIRMAN. The committee will go into executive session.

(Whereupon, at 12 noon, the committee proceeded into executive session.)

(The following was furnished for insertion:)

INTERAMERICAN TROPICAL TUNA COMMISSION,
August 6, 1959.

Hon. HERBERT C. BONNER,
Chairman, Committee on Merchant Marine and Fisheries,
House of Representatives, Washington, D.C.

DEAR CONGRESSMAN BONNER: Mr. Vetter, the Executive Secretary of the National Academy of Sciences, National Research Council's Committee on Oceanography, has advised me that you will soon hold hearings on the subject of an atomic-powered icebreaker, and has suggested that comments on this matter might be welcome.

As you know from the report of the Committee on Oceanography, we feel that icebreakers, in general, are of limited utility in arctic oceanographic research, although they do have their place. The U.S. need for an atomic-powered icebreaker, in contrast to conventional power, however, is not evident. The U.S.S.R., of course, has built an atomic icebreaker, the *Lenin*, but the Russian needs for such a vessel are rather different from ours. As you know, Russians maintain a commercial shipping route in the arctic seas between Murmansk and various ports of the Siberian coast and require icebreakers to keep this shipping route open. For this purpose, a powerful icebreaker of very long range, requiring refueling at very infrequent intervals, is of obvious value. In contrast, the U.S. requirements in this regard appear to be only for the maintaining of bases in certain arctic regions and it is not evident that an atomic icebreaker is particularly economic for this purpose.

So far as research in the Arctic is concerned, it is doubtful whether an atomic icebreaker is of value commensurate with the cost, either for the Russians or for ourselves. As the Committee on Oceanography has pointed out in chapter 7 of its report (p. 17), icebreakers and ice-resistant vessels are useful in doing research near the fringe of the icepack, but this can probably be most economically accomplished by designing improved research capabilities into conventional-type vessels.

Except in the fringe areas, it would appear that research can be better conducted by going under the ice rather than breaking through it. The ideal vehicle, of course, would be a vessel which can operate under the ice and also has the capability of breaking through the ice from below. For this purpose, the best craft would obviously be a submarine, specifically designed for this sort of work. Atomic power in such a submarine is, of course, a necessity.

In summary, then, my opinion which, I believe, corresponds with that of other members of our committee, is that an atomic-powered research submarine, with icebreaking capabilities, would be much superior to an atomic-powered surface-type icebreaker for the needs of the United States in the arctic and antarctic regions.

Trusting that these comments will be of value to you, I am

Yours very truly,

MILNER B. SCHAEFER,
Director of Investigations.

WOODS HOLE OCEANOGRAPHIC INSTITUTION,
Woods Hole, Mass., August 10, 1959.

Hon. HERBERT C. BONNER,
Chairman, Merchant Marine and Fisheries Committee,
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: I have been told that you and your committee are having another look at the atomic-powered icebreaker.

From the standpoint of oceanography an icebreaker, whether conventionally powered or atomic powered, is far from an ideal platform. It lacks mobility. Simply to build a more powerful icebreaker does not gain you much in mobility. You still have to back up and charge ahead every few minutes wherever the ice is thick. With more power you gain a few extra yards each time you charge the ice, but it is still a slow business. In thick ice you are lucky to make good 2 miles an hour.

Mr. W. G. Metcalf of our staff has made a number of cruises on conventional icebreakers in the hope of accomplishing some science. He has about given up so far as oceanography is concerned. I asked him for his views and as a result he has prepared the enclosed memorandum.

Sincerely yours,

C. O'D. ISELIN.

AUGUST 10, 1959.

MEMO TO MR. ISELIN, RE ATOMIC ICEBREAKERS

The atomic icebreaker enjoys one real advantage over the diesel-electric type, namely, range. Unless a clear need for the great range can be demonstrated, it would seem that the expense of the atomic icebreaker would be difficult to justify. A very great range could be built into a large diesel-electric icebreaker which should be sufficient for all our foreseeable needs.

In the 1958 committee hearings on the subject, there were three major points made by those favoring the atomic icebreaker. (1) The need to support our arctic and antarctic commitments by transporting supplies and convoying ships to distant bases. (2) The fact that the Russians have an atomic icebreaker, and therefore we should also have one to keep from falling behind the Russians in our arctic capabilities. (3) The requirements for a suitable vehicle for polar scientific research.

As to (1) there is quite apparently a need for new, large, versatile icebreakers for supporting our arctic and antarctic commitments. The money saved in building a large long-range diesel-electric icebreaker could be used towards building another one. Our present icebreakers are beginning to wear out, and several replacements are needed.

As to (2) the Russians have a real need for an icebreaker with the long range obtainable only in nuclear power. They are attempting to exploit thousands of miles of Siberian coastline for commercial and military shipping. Their requirements are for icebreakers which can stay in the area for several seasons continuously. Their convoy problems along the northern sea route are very different from ours.

As to (3) I feel that to cite the needs of science as even partial justification for building an atomic icebreaker is obscuring the real issue. Arctic science certainly is in need of a suitable vehicle, but the atomic icebreaker is not the vessel which best fills our requirement.

Admiral Colbert, in his testimony before the committee listed several scientific problems in need of study. These were cited as demonstrating a need for an atomic icebreaker. In most cases, an atomic submarine or atomic submarine-icebreaker would clearly be a superior vessel. One project involved a bathymetric survey of the Canadian Arctic Archipelago. The use of an icebreaker is indicated here, but the need for atomic power is not.

Much emphasis in the hearings was placed on the problem of navigating within the polar pack with an atomic icebreaker. Admiral Thomas was asked if the Russian icebreaker would be able to break 40 feet of ice. He replied, "If the ice has someplace to go, and if she is able to carry sufficient momentum."

Space for the ice to go and space in which to develop sufficient momentum are two of the things most lacking in the polar pack. Even if the icebreaker were able to enjoy some degree of freedom in navigating within the pack, the

advantages to be gained in a nuclear submarine operating under the pack are overwhelmingly greater.

In summary, I feel that whether or not the vastly increased range of the atomic icebreaker justifies the cost of such a vessel as far as military requirements are concerned is a problem to be decided by the military. Any attempt to use the needs of science as justification for such a ship is not a realistic approach. The requirements of science in the polar regions would be much better served by nuclear submarines.

W. G. METCALF.

WOODS HOLE OCEANOGRAPHIC INSTITUTION,
Woods Hole, Mass., August 10, 1959.

Hon. HERBERT C. BONNER,
Chairman, Merchant Marine and Fisheries Committee, House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: Transportation in polar regions is of prime importance to oceanographers interested in polar research, and I have followed the hearings on your bill H.R. 9196 with great interest both as an individual and as Chairman of the Panel on Engineering Needs for Ocean Exploration of the National Academy's Committee on Oceanography. Our panel spent considerable time discussing the polar transportation problems with oceanographers such as Waldo Lyon of San Diego and William Metcalf of Woods Hole. Our recommendations in chapter 7, page 17, of the Academy report were:

"SHIPS FOR RESEARCH AT HIGH LATITUDE"

"Research near the fringe of the icepack can be done from an icebreaker operated by the Navy or the Coast Guard. Provision should be made for this in the design, alteration, and operation of icebreakers. For example, the effect of bad weather and ice should be reduced as much as possible by working under a cover and through a center well or a system with comparable advantages.

"Except in the fringe areas icebreakers are of limited value to arctic oceanographic research compared to submarines properly equipped to break in and out of the ice as well as to go under it. Efforts to design and to develop such a submarine or such modifications should proceed immediately. Specific modification for these purposes is essential but may not have to be extensive. Such submarines offer the most practical way of exploring and studying the Arctic Ocean. Arctic research is not only of great scientific importance but is also of wide public interest."

In the summary chapter the parent committee reemphasized the importance of a special icebreaking submarine as follows (item 5, p. 18, ch. 1):

"Surface icebreakers are of limited value to arctic oceanographic research compared to properly equipped submarines. Efforts should be made to develop a submarine capable of breaking into and out of the ice."

I realize that during your hearings the question of a submarine icebreaker was discussed briefly and considered impractical. Oceanographers are not naval architects, but we strongly recommend that the design of a submarine icebreaker be very seriously considered because a craft that could break and penetrate ice from below as well as above might well be mobile in polar regions in a way which neither conventional icebreakers nor conventional submarines could ever hope to be.

Serious consideration of a design study of an icebreaking submarine may be beyond the scope of your present investigations but certainly for science, and perhaps for supply and rescue missions, such a design would seem to incorporate the best features of our technology.

Very truly yours,

ALLYN C. VINE.

COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK,
DEPARTMENT OF GEOLOGY,
LAMONT GEOLOGICAL OBSERVATORY,
Palisades, August 11, 1959.

Hon. HERBERT C. BONNER,
Chairman, House Merchant Marine and Fisheries Committee,
House of Representatives, Washington, D.C.

DEAR SIR: I understand that your committee will hold hearings on an icebreaker bill on August 13 and 14. It is my opinion that the areas open only to icebreakers offer some of the world's choicest targets for geophysical research. During the past two antarctic summers our small schooner *Vema* has worked as near the edge of the ice as such a vessel dares go, and in the coming season we hope to work our way right around the whole Antarctic Continent with her. The results, to date, of our work in high southern latitudes are impressive. I am sure that by the time icebreakers might be available for serious scientific work we will have dozens of specific problems set up for attack.

The needs are twofold: (1) We must have icebreaking ships with the ability to range widely in the Arctic and Antarctic Oceans, with facilities for scientific observations of many types built in; (2) these ships must be administered under some plan so that the guarantee of opportunity to make observations is firm enough that a serious scientist can afford to devote time to a voyage on them.

Very truly yours,

MAURICE EWING.

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